

Chemical Weekly

VOL. XXXIV

SEPTEMBER 5, 1989

NO. 52

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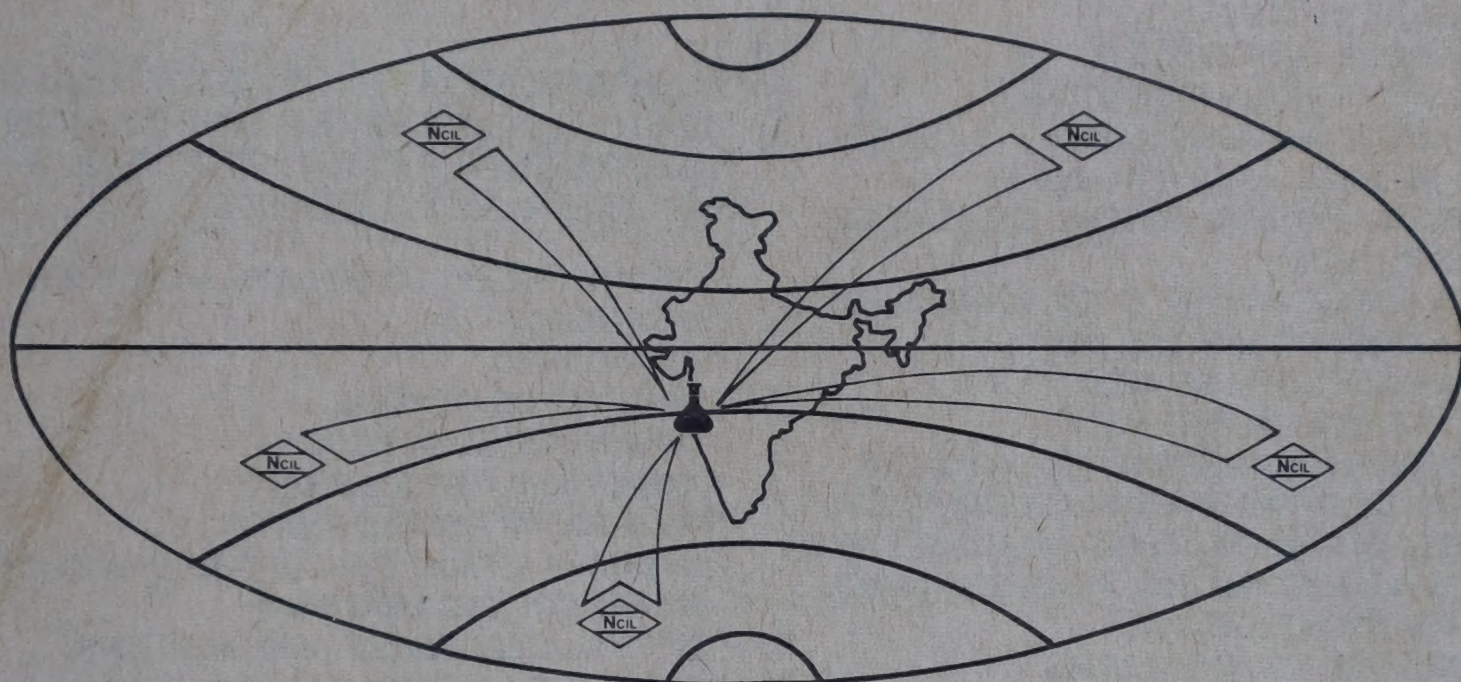
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- ★ Projects & Technology Transfer
- ★ Bio-Technology

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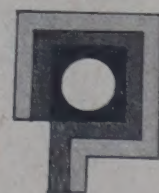
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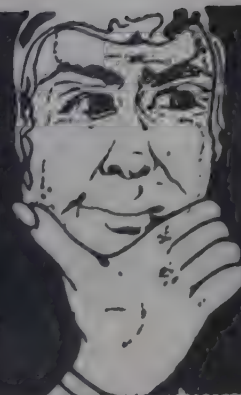
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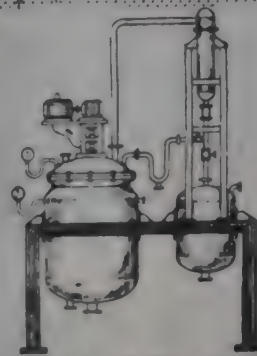
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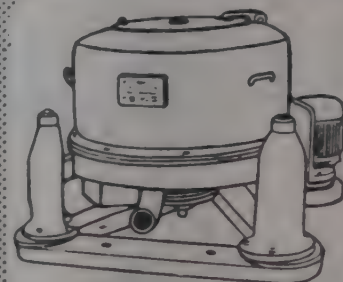
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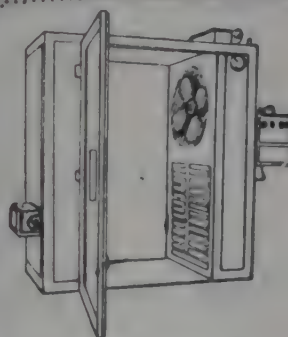
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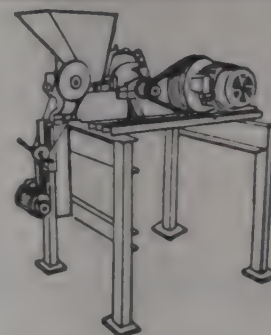
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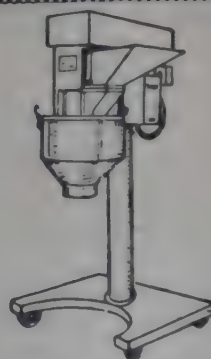
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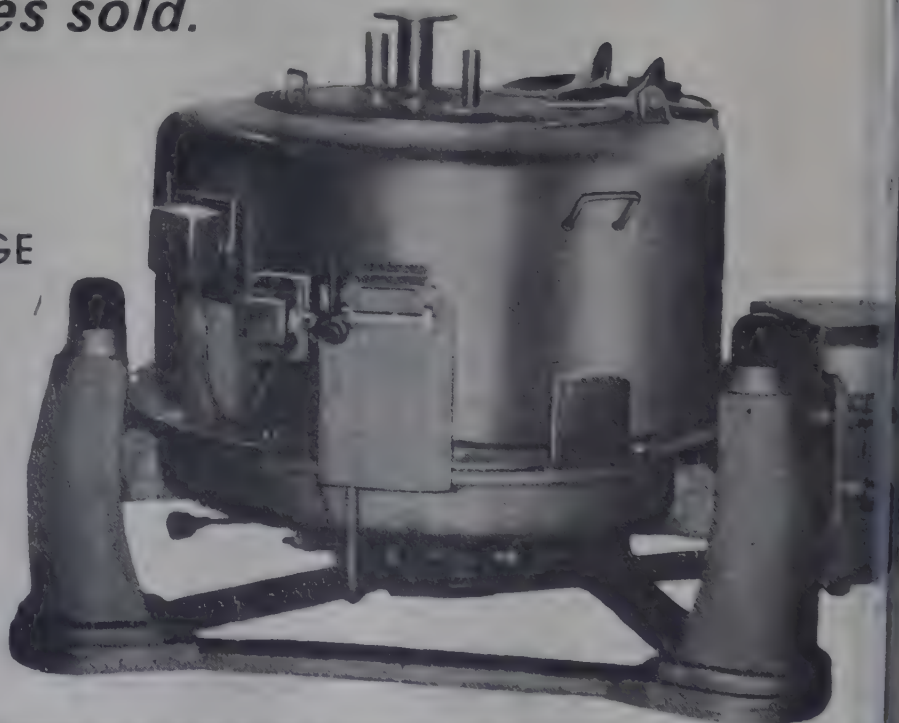
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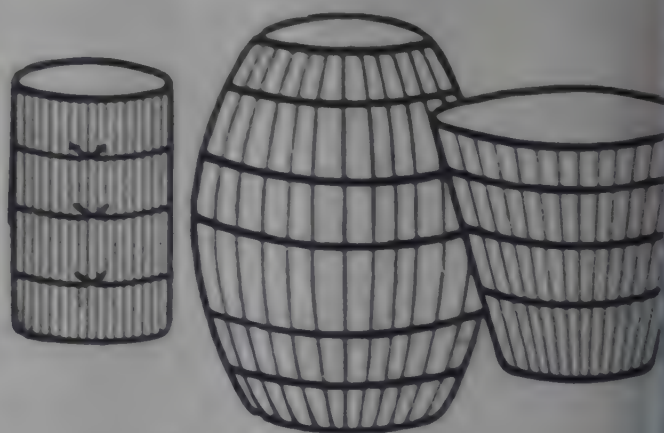
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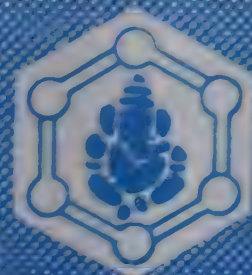
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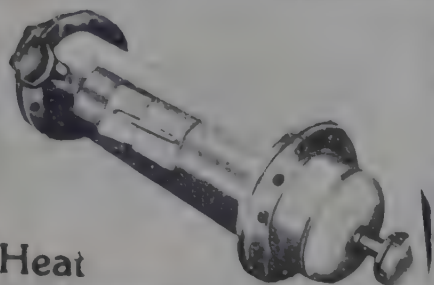
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CHEMICAL WEEKLY

VOL. XXXIV

SEPTEMBER 5, 1989

NO. 52

HERALDING THE 21st CENTURY - 26 (c)

Global consequences of man's abuse of Mother Earth

The preceding six articles on the topic of the anticipated environmental disaster in the coming century have focussed attention on a few specific aspects of the damage caused by man's thoughtless actions harming his own future. The following two articles are a resume of the views of Lester R. Brown, Project Director of the "State of the World", 1989 edition of the environmental magazine, World Watch Institute entitled "Global Ecology on the Brink".

Of all the environmental problems emerging in recent years, the potential for climate change on a global scale is most worrisome. Climate change results from the rising world consumption of fossil fuels and the deforestation associated with population growth. The average man and woman will see the eventual economic consequences of these forces in terms of rising food prices. Ultimately, then we can say the issue is food, and that in turn is rooted in climate, energy policy and population policy.

It is certain that food security will displace military security as the principal preoccupation of governments. World grain reserves may now be at the lowest level since right after World War II. The world's carryover stocks of grain now amount to an estimated fifty-four days of consumption. That's the key food indicator to watch.

Several things are contributing to a slowdown in the growth of food production, including the increasing scarcity of land and water resources. There simply is not much good land in the world waiting to be ploughed! And in each of the four major food-producing countries -- the United States, China, the Soviet Union, and India -- pressures on water supplies are intensifying. The cities and the countryside are competing for fresh water, and that is beginning to emerge as a major political issue.

In addition, farmable land in the United States, China, and the Soviet Union has declined substantially in recent years. The United States, is in the process of retiring 11% of the cropland, converting it either to grassland or woodland under the Conservation Reserve Programme. This involves 40 million acres of highly erodible land that cannot sustain cultivation indefinitely, as it is now being farmed.

The Soviet Union does not have a conservation reserve programme, and since 1978, they have lost 13% of their grain land. They do not systematically retire it, they just keep ploughing it until it is not worth ploughing anymore. There is a substantial additional area of land that is still being eroded, but has not yet reached the point where it's not worth ploughing anymore.

In China, the loss of cropland -- about 7% over the last decade -- is due not so much to erosion as to mounting demands from the nonfarm sector. According to the World Bank, China's rate of industrial growth, since 1980, has been about 12.5% per year, which means that literally thousands and thousands of new factories are being built every year. Most of China's 1.1 billion people are in the 1,000-mile belt on the eastern and southern coasts of the country. Factories have to be built where the people are; the people are where the cropland is; and much of the land that's being claimed by factories, warehouses, and access roads is good cropland.

One of China's great scarcities in recent decades has been housing. And so, as incomes have gone up, everyone and his brother in China has wanted either to add another room or two or build a new home. And again, because the people are spread throughout the countryside where the cropland is, construction has claimed cropland in most cases. So, the Chinese are losing cropland at a rate that is very difficult to offset in terms of higher yields from remaining farmland. This is one reason why China is going to be importing 20 million tonnes of grain this year, which puts them in third place, after Japan and the Soviet Union.

The Soviet Union, according to latest reports will import something like 40 million tonnes, so will Japan.

Water scarcity is another crucial issue. In the United States, the decline in irrigated area of some 7% since 1978, is the result of falling water tables, for the most part. Weak commodity prices and higher pumping costs, particularly for fuel, have also contributed. But the U.S. Department of Agriculture (USDA) recently reported that one-fourth of all the irrigated cropland in the United States is being irrigated by drawing down the underground water table by at least a half

foot a year. In some cases, the drop is as much as four feet per year.

In the Soviet Union, much of its irrigated agriculture is clustered around the Aral Sea in the Asian Republics. The Aral Sea lies on the borders between Kazakhstan and Uzbekistan, and is fed by two rivers, the Amu-Darya and the Syr-Darya. In 1960, before irrigation got seriously underway, the Aral Sea contained an estimated 10 billion tonnes of salt. But as the two rivers that feed the Aral Sea were diverted for irrigation, the water inflow into the sea fell below the evaporation rate. So the sea began to shrink. As a result, one fishing port, Mynak, is now thirty miles from the coast.

The sea in the Asian part of the Soviet Union has lost 60% of its water and 40% of its area, and that process is continuing. Because much of the sea bed is now dry and covered with salt, winds blow up salt storms just like desert sand storms. As a result, a sand/salt mix is now being deposited on the land that's being irrigated with the water that was originally intended for the Aral Sea at a rate of about a half a tonne per hectare per year. That is beginning to affect the cropland. More importantly, the climate of the region is being affected, as the frost line shifts south, the cotton-growing area has been reduced by nearly half a million hectares or more.

This presents a very serious problem: The Soviets either have to cut back on irrigation -- on the amount of water they use for irrigation -- to save the Aral Sea, or they have to write off the Aral Sea. Almost all the fish are dead now because it's so salty; there are only three species left out of the twenty-six that were in there originally. They have to write off the fishing industry. They have to accept the fact that the climate will become more harsh in both the summer and the winter, making the region less hospitable to agriculture. Northern China already is facing severe water shortages, and water that's needed to serve urban needs and industrial needs is taken from agriculture. As a result, China's irrigated area, like that of the United States, also is shrinking. In fact, the irrigated area in China has declined by 2%, compared with 7% in the United States.

Raising the productivity of land has been an increasingly difficult problem. For example, in Japan, rice yields have increased little since 1970, despite the fact that the rice support price offered to Japanese farmers is four times the world market level. And even with that astronomical price -- a price that only the Japanese can afford -- nothing is happening to improve Japanese agriculture. The highest yielding rice varieties available to farmers in Asia today were released in 1966 -- twenty three years ago. No one has been able to improve on that. So the rise in rice yields in many Asian countries is slowing. In China and Indonesia, for example, there's been little or no increase in grain production since 1984.

Agricultural planners at places like the World Bank are deeply concerned. When one combines the Asia situation with the crisis in Africa, it's becoming more and more difficult to see how we are going to grow enough food to satisfy the

demand from the annual addition of eighty-six million people to world population. The fragile balance between food and population growth also is illustrated by the loss of topsoil. Each year the world's farmers are losing about 24 billion tonnes of topsoil in excess of the new soil being formed through natural processes. That loss almost equals the amount of topsoil on the wheat-growing land of Australia -- not an insignificant amount.

Against that backdrop, climate change emerges as quite possibly the dominant environmental and economic issue of the 1990s and beyond. This loss of momentum in world grain production, combined with the North American drought in 1988, has reduced world grain stocks from the equivalent of 101 days of world consumption at the beginning of 1987 to 54 days at the beginning of 1989. This explains why world grain prices are half higher than they were a year ago. The January 1989 report of the U.S. Department of Agriculture on the condition of the winter wheat crop indicates that much of the wheat crop in the Great Plains is already suffering from severe to very severe moisture stress, and this accounts for three-fourths of the total wheat crop. Spring wheat, grown in the Northern Plains, accounts for the remainder. Last year U.S. grain production fell below domestic consumption for the first time in modern history. The USDA estimates that the U.S. will be consuming 206 million tonnes of grain this year, but the harvest was only 196 million tonnes, a 10-million-ton-deficit by drawing down from reserves, which were fairly substantial at the beginning of 1988. The U.S. have export commitments for close to 100 million tonnes which they will satisfy this year by exporting from reserves. But when the 1989 harvest begins, those reserves will be largely gone -- a grim prospect indeed.

The prospect of another drought-reduced harvest in 1989 like that of 1988 is scary. For the first time since North America emerged as the world's breadbasket some decades ago it might not have any grain to offer the world. This would lead to a frantic scramble among the hundred or so countries that import grain from the United States for meagre exportable supplies from Argentina, Australia and France. No one knows how much the grain prices would go up -- they could triple, even quadruple. Such a rise would send a shock wave through the world economy. That would make the oil price increases of the '70s appear modest, by comparison.

By the time atmospheric carbon dioxide levels double by the year 2030 or 2050 -- whenever it comes -- the average global temperature will increase by somewhere between 2 and 8 degrees Fahrenheit. But those averages mask the real dramatic changes. There won't be much rise in temperature in the equatorial regions of the planet. Most of the increase will come in the higher latitudes in the Northern and Southern hemispheres -- the grain-growing regions. The average number also conceals the fact that the temperature increase over land will be substantially greater than over the oceans. With these two together, we will be moving into uncharted territory with climate and with its effect on world food supplies.

-- T.P.S. RAJAN

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Clean air and environment

The data on the ozone depletion scare of recent years has sent shock waves through most of the developed countries. This is one single serious disturbance of the delicate balance of the components of the atmosphere and stratosphere which could be specifically linked to some synthetic chemicals released into the atmosphere. The depletion of ozone in the stratosphere can lead to disastrous repercussions on the life and activities of mankind. The concern with the atmospheric smog over local areas in cities has been evident for some years and the regulations on exhaustions from automobiles have been enforced setting limits on hydrocarbons, carbon monoxide and nitric oxides. Catalytic converters to remove these in the auto exhaust have been introduced. But other emissions into the atmosphere from factories or power houses such as carbon dioxide and sulfur dioxide have repercussions across countries and continents. One of the manifestations has been of "acid rain" -- acidic precipitation containing sulphuric acid and nitric acid -- which can spoil the lakes or slowly destroy foliage cover. Acid rain has been a subject of much argument and dispute between USA and Canada and there is now some understanding for abatement of acid rain generation with US agreeing to reduce the emission levels of sulphur dioxide in the flue gases over a period of years. Steady increases in carbon dioxide content of the atmosphere due to the steadily growing use of fossil fuels or firewood have been recorded and the long-term effects on the climatic condition have been forecast. Higher carbon dioxide levels will lead to a rise in temperature and may lead to melting of ice caps and higher sea levels inundating large coastal areas.

All in all we have reached a stage when international effort called for to preserve the atmosphere in the coming decades. Much effort is required within the large countries such as USA and the repeated warnings by the organisations such as the "World Watch Institute" have their effect. It is noted that the US Administration even under a Conservative Republican Presidency has seen fit to proceed with "sweeping but costly programmes to abate acid rain, clean up urban smog, and control cancer causing emissions from industrial plants and mobile sources" besides the ongoing programmes on clean-up of landfills of their poisonous heritage. (*CE News* 19 June, 1989).

President Bush's three pronged plan for clean air comprises action, on (i) to reduce sulphur dioxide emissions of

107 coal fired power plants in 18 States from 10 million tonnes annually (1980 data) to 2 million tonnes by AD 2000 at an estimated cost of \$3.8 billion; (ii) motorvehicles and about thirty categories of industries including chemicals will be subject to regulation of 187 toxic air pollutants of the present order of 2.7 billion tonnes -- cost of \$ 2 billion; (iii) Motor vehicles and sources such as dry cleaners and painting outfits will be subject to limits on solvent emissions/hydrocarbons and obliged to attain ozone standards -- at a cost of \$ 4 billion.

These are the broad outlines of the legislation which will come up while priority is on coal-fired electric utilities. Clean coal power technologies are available at a cost which can be passed on to the consumer. A welcome feature is the "trade" in pollutants, buy and sell the "right to pollute" either between the plants owned by the same organisation and ultimately with other plants so long as the "polluter pays" is agreed to. The "dirty" utility companies will have to cut emissions of sulphur dioxide by 5 million tonnes a year by AD 1995 and a further 5 million tonnes by AD 2000. They have also to cut on nitrogen oxides to the level of 2 million tonnes a year. They could switch over to lower sulphur coal or flue gas scrubbers or promote energy saving by their customers or adopt innovative technologies that avoid pollution by the fuel used (via gasification). One estimate is that costs of power generation will go up.

Another major source of pollution is by Steel mills' coke ovens besides chemical plants. EPA -- Environment Protection Authority -- is expected to enforce limits on emissions of specified chemicals categorised by sources. The principle of MACT -- Maximum Available Control Technology -- will be used and emission limits will be based on it. But when better technology is available in later years it is not specified whether the earlier MACT in use could continue. EPA proposes to have a Chemical Safety Board on the lines of the National Transportation Safety Board which would maintain a data inventory and ensure visits, inspection, analysis and report on the polluter factories. The Board will also formulate measures for ensuring that there is no likelihood of a Bhopal type disaster and also recommend further control where required to protect the public from unreasonable risk. Stringent measures are expected to control vehicle exhaust -- the limits on sulfur may extend to nitrogen. Volatility of gasoline will be reduced by a cut in the content of butanes.

Vehicles using clean fuels like methanol, ethanol or natural gas will be encouraged with a phase-in of such vehicles of up to a million such vehicles a year, in the most seriously polluted areas. The reactions of the oil and utility industries seem to be mixed while the chemical industry is expected to have no serious problems in complying with the expected new regulations. After all the chemical industry was ahead

of Government agencies in recognising the CFC/ozone tangle and efforts to develop alternatives.

India is at the cross-roads of development and pollution and needs to have an in-depth analysis of the situation and effective steps for ensuring clean air and safeguards against all deleterious components in the liquid effluents.

Export prospects for bulk drugs

Our balance of trade is steadily getting worse in spite of our efforts for exports of a wide range of products. Certain items have shown spectacular growth as for example diamonds and jewellery but over 60% of the value of exports needs to be spent in imports of raw diamonds and gold. Leather goods have shown good growth and garments too. According to a recent report, India's exports in 1987-88 was Rs. 16,396 crores as against imports of Rs. 25,692 crores leaving an uncovered gap of nearly 8,300 crores which is to an extent reduced by invisibles. But even here it is reported that payments against investments by foreigners is much higher than receipts by India from her own investments abroad. Transportation also shows a deficit. The only saving feature is the NRI money transfers into the more attractive Indian deposits. Tourists do provide a significant positive foreign exchange earning but all these are not of a magnitude to cover our BOP deficits. We are hoping for a 38% rise in exports this year but problems of higher dollar value and the large chunk of Rupee area exports.

One of the major sectors where exports have picked up are chemicals including mineral-based item like alumina. The negative side is the large value of imports as inputs for fertilizers -- this year 2.3 million tonnes of DAP is to be imported to supplement phosphoric acid imports to feed our own DAP production. Rock phosphate, sulphur and potash are inevitable imported inputs. The import of petrochemicals is a whopping 1,000 crores and our programmes are for continued imports of basic intermediates even if we reduce our imports of polymers. There has been talk of our exporting olefines from naphtha cracking and an export oriented programme but it looks prima-facie illogical.

However two main areas of chemical industry deserve special mention as having good export potential -- drugs and dyestuffs and dyestuff intermediates. One of the successful pioneers in bulk drug exports is Dr. Anji Reddy of Hyderabad who projects the programme of his companies -- Dr. Reddy Laboratories and Chemineer for a massive Rs. 137.5 crores by 1991-92. The items are Ibuprofen, Ranitidine,

Methyl dopa, Norflaxacin. For all these, the processes are novel and do not impinge on patent claims. With the lapse of product patent right -- in any case India does not recognise these -- and processes of high efficiency which result in lower costs and competitive position in US market, Dr. Reddy was primarily responsible for a cheaper process for sulfamethoxazole which has now been widely adopted by a number of producers who have built up an export market. The estimate of IDMA of major bulk drugs exported to USA is as under:

	(Rs. in millions)	
	1987-88	1986-87
Sulfamethoxazole	172.0	70.0
Ethambutol	75.0	45.0
Ibuprofen	86.6	19.5
Cefalexin	37.5	--
Amoxicillin	48.8	27.7
Ampicillin	65.7	4.5
Total	485.6	203.7

India's status on exports to USA is of a developing country with customs duty exemption which ensures competitiveness and creates some anxiety among US producers. Attempt to get customs duty levied on ibuprofen by one of the producers in USA did not prove successful. But even so India imports far more drugs from USA as compared to our exports. In spite of this US had chosen to brand India along with Japan as attracting attention under the provisions of Super 301 regulation in USA. There is a lot of opposition to India's patent law which enables production and marketing in India without attracting the provisions of product patents.

Bulk drugs is one area of promise but even here while values can go up the net overall balance of payment after including import of intermediates is not happy. While our export efforts can succeed it is still likely to be far behind our imports and more thought is necessary to look at our imports more scrupulously and attempt to cut them in the next few years to achieve proper balance.

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M RTP Act: ASSOCHAM seeks hike in asset limit

The Associated Chambers of Commerce and Industry (ASSOCHAM) has suggested that the asset limit for business houses to come under the Monopolies and Restrictive Trade Practices (MRTP) should not be less than Rs. 500 crores against Rs. 100 crores at present.

An ASSOCHAM release says that its president, Mr. Viren Shah, has called for amendments in three major areas, namely, asset limits, dominant undertakings and interconnections, so as to make the Act growth-oriented. The MRTP Act, Mr. Shah has said, has been one of the main constraints in achieving faster industrial growth. In his view, the Act should be given new orientation so that it facilitates rather than restricts the country's industrial development.

ASSOCHAM has contended that the size of a business enterprise, by itself, cannot be detrimental to common interest. The current asset limit is highly unrealistic in the context of high cost of projects with minimum economic capacity. Also, only productive assets should be considered for the purpose of ascertaining the concentration of economic power. For this purpose the fixed assets as shown by the books of the company could be taken. There is no point in taking current assets as they fluctuate on a day-to-day basis.

ASSOCHAM memorandum points out that the units with a project size of upto Rs. 50 crores are exempt from industrial licensing if set up in certain backward areas. The project costs include only fixed and long term assets and not current assets. It is not possible for entrepreneurs to set up a Rs. 50 crore project in a backward area without coming under the purview of the MRTP Act since the ratio of current assets to fixed assets being of the order of 3:1 invariably, the total value of the assets would definitely cross Rs. 100 crores.

ASSOCHAM has also suggested change in the definition of a "dominant" undertaking, the asset limit for which was fixed at Rs. 1 crore in 1961. In the context of the revision already made for large undertakings in 1985 from Rs. 20 to Rs. 100 crores, fixation of the minimum economic capacity levels by the government and the need to ensure optimal utilisation of the available resources through broad-banding, ASSOCHAM has recommended that the limit for registration as a dominant undertaking be increased to Rs. 25 crores.

ASSOCHAM has suggested that in the case of industries coming under the IDR Act, the undertaking may be considered dominant only if its installed capacity or actual production or market share is more than one-third of the total installed capacity or the actual production or the market share in the country as against the present one-fourth ratio.

For determining 'dominance' the capacities established by small and medium scale industries should also be taken into account irrespective of the fact whether they had industrial licence or are registered. Since these units also contribute to the demand and supply pattern in the country, it would be incorrect to ignore their existence.

ASSOCHAM has pointed out that definition of 'interconnection' in the MRTP Act on the basis of 'group' concept is very complicated and gives rise to uncertainty and avoidable hardship to the business and industrial community. In ASSOCHAM's view, interconnection on the basis of common directors should only be through a majority of the directors of one body corporate also constituting either by themselves or together with their relatives. Majority of directors, employee directors and the institutional nominees should not be included. In fact, companies in which

the financial institutions hold more than one-third of the total voting power should be kept outside the interconnection ambit since the institutions have an overriding say in the management of such companies.

JK GROUP PLANS HFS PLANT IN UP

J.K. Industries Ltd. proposes to set up a 15,000 tonne high fructose syrup (HFS) plant in Uttar Pradesh. As many as a dozen units had in the past planned to produce this sugar substitute, but gave it up as it could not compete with sugar. Now that sugar is ruling at Rs. 10 a kg some are having a second look at the product.

In the United States, fructose is a rapidly growing industry, having captured 20 per cent of the sweetener consumption of 50 kg. per person per year. The European Economic Community has blocked its use in the continent out of the fear that it would threaten the traditional sugar beet farmers.

Fructose can be produced from maize (corn), potato, wheat, sorghum, tapioca, barley, rice and the like. Starch extracted from these materials, is transformed into glucose, part of which is isomerised into fructose. Brazil, a leading cane sugar producer, has been encouraging production of fructose so that it can have more cane sugar to spare for the export market. Advocates of HFS point out that sugarcane is a 12-month crop requiring heavy irrigation. During this period, the farmer can raise three crops of starch-bearing crops.

The product has not made much headway in India in the absence of a substantial price advantage over sugar. Being a liquid, HFS calls for additional investment on storage. Abroad, HFS is extensively used in soft drinks and confectionery. A leading Indian biscuit manufacturer found that biscuits tend to lose their regular shape when HFS was used. It is more suited for cool

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PIL to import HDPE

Polyolefins Industries Ltd., India's only producer of high density polyethylene (HDPE), is to import the material from this month for distribution through its wide network of distributors.

PIL has been concentrating on two grades of HDPE which dominate the Indian market — raffia grade used in the manufacture of woven sacks and HM film used in consumer goods packaging. Pipe grade is another growing market. PIL pioneered the end applications of HDPE in the country.

In addition to its familiar applications, it has penetrated rural areas. For example, it has developed a special grade for domestic gas and bio-gas applications. PIL has so far installed 103 community biogas units totalling 244 km. of HDPE pipes.

The company now proposes to rationalise its product range by importing 500 to 1000 tonnes of the material every month, especially grades other than raffia and HM film. This will help small consumers who are not equipped to import the material under OGL. International prices are now stabilising after a steady fall for the past few months, making it an opportune moment to import.

It will also help consolidate PIL's position in the market at a time when new capacities are being set by other companies. One of them, Indian Petrochemicals Corporation Ltd. (IPCL)'s Maharashtra Gas Cracker Complex (MGCC), is to commission its HDPE plant in the new year.

The other aspirant is Reliance Petrochemicals Ltd., likely to go on stream in the early 1990s. Both IPCL and RPL have opted for technologies which cannot produce raffia grade and HM film grade of the quality that PIL's slurry process has been producing.

PIL has not been utilising its full

capacity due to inadequate supply of ethylene from NOCIL. Its capacity is now being stepped up to 75,000 tonnes with the help of ethylene to be supplied by MGCC through a pipeline being laid by the company. The additional capacity is expected to come on stream by March-April next year. PIL will also augment supplies of ethylene vinyl acetate a versatile copolymer launched early this year.

The company has in the meantime revived its application (shot down earlier by the Monopolies and Restrictive Trade Practices Commission) to expand HDPE capacity by an additional one lakh tonnes. The project is estimated to cost Rs. 224 crores, which will be met by internal accruals supplemented by the issue of shares/convertible debentures and other instruments. The project cost includes a foreign exchange component of Rs. 71 crores. The fate of the application depends on NOCIL's request for expanding its ethylene capacity to three lakh tonnes, which is presently under the active consideration of the Government.

ONGC SIGNS PACT FOR YEN LOAN

The Oil and Natural Gas Commission (ONGC) has concluded an agreement for a loan of yen 20 billion with the Long Term Credit Bank of Japan and the Sumitomo Life Insurance Corporation Limited.

The loan with 10 year bullet maturity has two tranches of yen 5 billion each. One tranche will be on Japanese tax spared basis while the other will be a conventional loan.

The ONGC has been able to secure the loan at interest rates substantially below the Japanese long term prime rate (JLTPR). The tax spared loan has been secured at 0.70 per cent per annum below JLTPR and the conventional

loan 0.40 per cent per annum below JLTPR. Since JLTPR is currently six per cent per annum, the tax spared portion carries interest at 5.30 per cent per annum and the conventional portion at 5.60 per cent per annum.

The loan is guaranteed by the government of India. This is the first time that ONGC has been able to find a loan from a life insurance company in Japan. Earlier, it had raised loans from banks as well as from direct investors through public offering of bonds.

An agreement in regard to the loan was signed in Hong Kong recently by Mr. M.C. Nawalkha, member (finance) on behalf of ONGC and by Mr. Hiroshi Nakajima, on behalf of the Long Term Credit Bank and Mr. Yoshitaka Maekawa on behalf of Sumitomo Life Insurance Limited.

HPCL POSTS Rs. 174 CRORE NET PROFIT

The Hindustan Petroleum Corporation Ltd. (HPCL) has achieved a record net profit of Rs. 174 crores during 1988-89, representing a 71.3 per cent increase over the previous year (Rs. 101.57 crores). The HPCL Marketing Director, Mr. P. Ramakrishna, told newsmen at Hubli that the sales turnover was Rs. 5,750 crores with a record market sales of 9.46 million tonnes of petroleum products, representing an 8.5% increase in quantity over the previous year.

He said the Corporation has already exceeded the Seventh Plan target of Rs. 581.42 crores in internal resource mobilisation, which was now Rs. 684.11 crores though there was yet a year to go for the completion of the plan period. Mr. Ramakrishna said the HPCL's Bombay and Visakhapatnam refineries have recorded an all-time high crude throughput of 9.27 million tonnes during 1988-89. Mr. Ramakrishna said the total sales of LPG during the year was 515,000 tonnes.

Bombay Dyeing for p-xylene under OGL

The Chairman of Bombay Dyeing Manufacturing Company Ltd. Mr. Wadia urged the Government to give paraxylene import to open general licence (OGL) status as its present canalisation through Indian Petrochemical Corporation Ltd. (IPCL) has brought about a host of problems.

Addressing the annual general meeting of the company at Bombay on August 29, Mr. Wadia stated that the import of paraxylene through canalisation has become a dilatory and tedious process besides adding to the cost of paraxylene through service and other incidental charges of the canalising agency.

Mr. Wadia informed shareholders that the company has had to suspend production for several days, and take this on one occasion since the canalisation of paraxylene. Despite repeated pleas, the permission to build up inventory stocks as a safeguard against simultaneous contingencies has not been received.

Replying to shareholders' query about production of paraxylene for captive use, Mr. Wadia made a dig at the Government policy which states that paraxylene could be manufactured by public sector companies but later gives back-door permission to a private sector company to manufacture paraxylene for captive consumption.

The company had sought the Government permission to increase the capacity of DMT from 60,000 tonnes to one lakh tonnes. For this purpose it also entered into a technical collaboration agreement with Huels Troisdorf. However, its application has been pending with the Government for over 18 months, he said.

The Chairman said that the company would implement the expansion programme in two-and-a-half years from receipt of permission.

The company's total exports stood at Rs. 13 crores during the first four months of the current year against Rs. 11 crores in the same period last year.

Sales has risen by about 22 per cent to Rs. 122 crore. Replying to the question of bonus issue of the company, Mr. Wadia said unless and until the situation on paraxylene is settled, which is likely to be within the next three to four months, the company cannot decide on a bonus.

Mr. Wadia said fortunately the DMT plant at Patalganga was not damaged during the unprecedented floods in August, but the plant had to be shut for a few days as water supply to all industrial units in the area was disrupted resulting in production loss of about 1000 tonnes of DMT. The plant is since running to full capacity. All resolutions, including special resolutions were carried unanimously.

FEASIBILITY REPORT SUBMITTED

The Central India Refinery will process about six million tonnes of crude annually, and will have space for considerable expansion at its site in Madhya Pradesh. Bharat Petroleum's detailed feasibility report has been submitted to the Ministry of Petroleum and the Planning Commission, which will decide on the appropriate investments for the Eighth Plan (1990-95).

A total of 4 new refineries of 6 million tonnes capacity each are likely to be built over the next decade. Two of these, will be built in the course of the next Plan — BPCL's Central India, and Hindustan Petroleum's on the west coast, probably at Hazira. The report of the sub-group on refineries for the Eighth Plan chaired by Mr. S.L. Khosla, has recommended a Plan provision of Rs. 3,021 crores. This includes expansion of 3 million tonnes to existing refineries.

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Breakthrough in crystal growing

The Anna University Vice-Chancellor, Dr.V.C.Kulandaiswamy, announced on August 29, that its crystal growth centre has achieved a breakthrough by growing a gallium arsenide single crystal last month. Speaking at a function in which the Union Minister for Human Resource Development Mr.P.Shiv Shanker, laid the foundation-stone for the centre, the Vice-Chancellor read out a commendation from the University Grants Commission on this achievement.

The UGC said, "A team of scientists led by Prof. P.Ramaswamy at the crystal growth centre of the Department of Chemical Technology, Anna University, has grown a gallium arsenide single crystal for the first time in India.

There is worldwide interest in growing single crystals of the gallium arsenide, due to their potential applications in the fields such as micro-electronics, fast computers, opto-electronics, and defence optical communications, for the speed of electrons in gallium arsenide is several times more than its speed in silicon. Very few countries in the world have so far grown single crystals of this strategic material.

"In recognition of this significant breakthrough achieved by the Anna University's crystal growth centre, the

UGC is proposing to develop this centre for the use of its research facilities by all Indian Universities. It will be recalled that the UGC had earlier supported the Department of Chemical Technology, Anna University, for crystal growth through the programme of strengthening the infrastructure in science and technology."

Dr. Kulandaiswamy said that even before this breakthrough was achieved, the eminent scientist, Dr. C.N.R.Rao, had recommended to the UGC that the centre be upgraded.

Variety of crystals grown:

Mr. P.Ramaswamy, Professor, Crystal Growth Centre, said its faculty were doing both theoretical and experimental work. The CGC had grown a variety of ferro electric, semi-conducting, photovoltaic, piezoelectric and laser crystals. About 100 various types of crystals had been grown.

The CGC had sophisticated equipment facilities to do research work. It had collaborative facilities with laboratories in the USSR, Pennsylvania State University, Oxford University and Stanford University.

Dr. B. Jagannathaswamy, Director, Alagappa College of Technology, Anna University, proposed a vote of thanks.

'CALMPOSE' OFF SCHEDULE

Diazepam, a tranquiliser widely known by the brand name 'Calmpose' has been removed from Schedule-Categorisation of the drug and Schedule-X which makes it mandatory for chemists to maintain records of patients' and the prescribing doctor's names and other details, was affecting sales of the drug, according to industry sources in Bombay.

Schedule-X comprises narcotics and other "habit-forming" drugs. Diazepam will continue to be treated as a habit-forming drug but outside Schedule-X so that chemists have a free time dispensing it without any restrictions. Under rule, prescription is still necessary. Calmpose, the leading Diazepam formulation, is manufactured by Ranbaxy Laboratories.

While the Govt. keeps updating its rules to ensure that producers upgrade quality control and enclose labels and warnings to enlighten the patient, even the existing regulations on dispensation of drugs by chemists are not enforced. Only a handful of chemists ask for a prescription. As a formality, some chemists write fictitious names of doctors prescribing a Schedule-X drug. Diazepam formulators allege harassment by enforcement agencies for not possessing TP-7 transport permits.

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Ships to transport ethylene

In a major diversification move, Mr. Abhey Oswal plans to acquire a shipping fleet. Investments are initially expected to be made in buying specialised vessels to transport ethylene all the way from his Chembur petrochemical unit in Bombay to the raw material-starved low density polyethylene (LDPE) plant in West Bengal.

Plans are also afoot to have a full fledged shipping fleet in due course. Oswal sources claim that the shipping industry has shown dramatic signs of revival to make investments lucrative again. It is not yet known what would be the extent of investments in this sector. Mr. Oswal's interest in shipping has resulted out of necessity than out of choice. The idea reportedly occurred as the Oswal group's Rishra unit faced a crisis, when the Uttar Pradesh government stopped supplies of alcohol to the unit. This forced Mr. Oswal to look for a switch in the raw material base from alcohol to ethylene within the next two years.

Ethylene will be manufactured in the naphtha gas cracker in Chembur, loaded into vessels and transported by sea to Rishra. It has been estimated that ethylene will be cheaper than alcohol. Alcohol prices are given to wide fluctuations and, at times, the price can flare up to as much as Rs. 10 per kg., inclusive of the high transport price by land. Besides, availability of alcohol varies in accordance with the production of sugarcane, with acute shortages sometimes giving way to glut. Under the circumstances, an inhouse supply base will assure stability of production, it is claimed. Availability of alcohol is also a problem on account of restrictions on inter-state movements.

Mr. Oswal bought the Rishra unit from ICI India (formerly, IEL Ltd.). As plans stand today Mr. Oswal intends to upgrade the cracker facility in Chembur to produce one-lakh tonnes of ethylene per annum which will be con-

sumed in-house — in the downstream facilities in Chembur, in the Illac unit (which he proposes to take over shortly), in Rishra and in other petrochemical facilities that he plans to set up. Meanwhile, Mr. Oswal has been able to secure two years' supplies of alcohol for Rishra from Uttar Pradesh. The state govt. in West Bengal has shown keen interest in getting the Rishra unit run.

S.M. DYECHEM

S.M. Dychem has fared well during the current year so far. During the first five months of 1989-90 the turnover has been Rs. 12.10 crores, an 85% jump over the turnover of Rs. 6.50 crores during the corresponding period last year. Profit after interest and depreciation were estimated to be Rs. 115 lakhs,

an increase of 130% on the previous period's figure of Rs. 50 lakhs, according to Mr. S.M. Shetty, Chairman of the company.

Addressing shareholders at the company's annual general meeting in Bombay recently, he said that the company plans to enter the petrochemical field shortly with the manufacture of ethylene oxide and monoethyleneglycols.

The project would be located in a centrally backward area near Pune. The approvals required are at an advanced stage. The Company's plan for a 100 per cent export oriented unit for the manufacture of methanol is also at an advanced stage of approval. The company had already tied up sales of 50 per cent of its production under a buy-back guarantee.

Parekh plans platinum plant

Parekh Platinum Pvt. of India is planning to build a plant near Bombay for the recovery of platinum, palladium and rhodium from petroleum and petro-chemical catalysts. The company has signed a memorandum of understanding with Gemini Industries of Santa Ana, California, whereby Gemini will provide technical assistance in the design and construction of the plant and direct the training of the technical staff.

Hasmukh Parekh, director and coordinator of the project for Parekh, said the agreement will permit Parekh to enter the expanding petroleum and petro-chemical catalyst business in India and surrounding areas. The company is already one of the largest manufacturers and refiners of precious metals products in India, he said, having developed platinum/rhodium catalyst gauzes and gold/palladium catalyst gauzes for the industry. Dr. El Guindy, president of Gemini, said: "The new facility when com-

pleted will represent one of the up-to-date and largest refining plants for catalysts in the Pacific Rim. Gemini currently obtains and recycles spent catalysts from around the world and upon completion of the Bombay plant it and Parekh will be in a position to further penetrate the market in the Pacific Rim.

Gemini said it has the largest specialised processing plant for recovery of precious metals from petroleum and petro-chemical catalysts in the world. The company said it is considering other joint venture operations in the world similar to the one with Parekh and is also looking to expand its product lines within the US.

The company is "discussing" with a major European country and two automotive manufacturers about the feasibility of constructing a processing and refining plant for recovery of precious metals from automotive catalysts in Europe."

Rubber imports may be discontinued

Rubber imports may be discontinued. According to the present thinking in the Ministry of Commerce, rubber imports may be discontinued for two reasons. Firstly, as there is an acute shortage of foreign exchange and secondly, further price rises would bring down the market prices affecting the growers.

However, according to sources in the Ministry of Commerce, a clear picture would emerge by the end of September when the Rubber Monitoring Committee will take a final decision. As of now, the committee after the clearance from the Finance Ministry has slashed the import duty on rubber to 25 per cent from 40 per cent to bring down the prices of rubber in the domestic market.

Rubber prices, of late, have shot up considerably following hike in import duties. India needs to import about 10-15,000 tonnes of rubber annually to fill in the demand and supply gap. The average production of rubber in the country is about 2.75 lakh tonnes. The demand is put at roughly 3.20 lakh tonnes.

The Rubber Monitoring Committee is headed by a senior Commerce Ministry official which decides on the quantity, quality and the time rubber is imported. The State Trading Corporation (STC) then floats global tenders to make purchases. Normally, STC makes purchases during November and December when the international market price is low. It releases rubber in the domestic market in different lots from March to August, when there is low local production and the demand is

This year, STC has imported about 30,000 tonnes of rubber of which it has already released 29,000 tonnes. The first lot which was released early this year was of 10,000 tonnes. This lot was released at only Rs. 23,573 per tonne, less than the Government had allowed to import the first 7,000 tonnes at

a concessional rate of duty of 25 per cent.

However, the next 10,000 tonnes was released at Rs. 27,400 per tonne as the duty was raised to 40 per cent. The third lot of 3,000 tonnes was also released at the same rate.

The hike in duty and subsequent rise in rubber prices in the domestic market, has upset the rubber users, particularly the non-tyre consumers to a considerable degree.

In fact the non-tyre users, which pick up 40 per cent of the total imports, refused to take deliveries from the STC godowns. According to rough estimates available from knowledgeable sources, of about 9,200 tonnes earmarked for non-tyre users of the 23,000 tonnes released by STC, they picked up only 50 per cent.

Following representations to the

highest levels in the Government made by the users, the Rubber Monitoring Committee again asked STC to release 6,000 tonnes at 25 per cent rate of duty, thereby bringing down the price to Rs. 25,100 per tonne.

The rubber pricing policy of the Government had always been to give a reasonable price to the growers. That is why unlike in the case of edible oil, where a price band is fixed, the Government fixes only the lower limit of rubber prices.

Till last year, the Government had made it clear that rubber prices should not be allowed to fall below Rs. 17,500 per tonne. But the upper limit was never fixed.

However, this year the international rubber price had been lower than in the previous year. The average purchase price of State Trading Corporation this year is about \$1,050 against \$1,600 last year.

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Industries asked to invest in technical training

The need for more investments in technical training by industries has been stressed by the Union Minister for Human Resource Development, Mr. P. Shivshankar, and others at a function on August 29, to mark the foundation-stone laying for a polytechnic under the auspices of Madras Refineries Ltd. (MRL) in its premises.

Mr. P. Shivshankar said there was a crying need for trained manpower in the process industries which meant training in new techniques of production.

He said the demand for petroproducts is expected to go up to 90 million tonnes by 2000 AD and the Eighth Plan allocation for petrochemicals is expected to be about Rs. 50,000 crores. He called upon the scientists to intensify the research for a substitute for crude which is fast getting exhausted.

The Tamil Nadu Education Minister, Mr. K. Anbazhagan, who presided said as more specialised industries were coming up the polytechnic was in order.

The Chairman and Managing Director of MRL Mr. V.R. Deenadayalu, who welcomed the gathering, said the company as 'mother industry' expected to generate Rs. 3,000 crores and employment for one lakh people in four to five years time in Manali.

The polytechnic will train those who wish to take up technical jobs in the field of oil prospecting, refineries and other chemical industries. It will also aim at upgrading skills of Madras Refineries Limited employees and those of neighbourhood industries. To start with a part-time course in petroleum engineering is to be introduced during 1989-90.

RELIANCE EOU CLEARED

The Cabinet Committee on Econo-

mic Affairs (CCEA) has cleared Reliance Industries Ltd.'s proposal to set up a 100 per cent export oriented unit to manufacture paraxylene and purified terephthalic acid (PTA).

At a recent meeting, CCEA cleared the project which involves an estimated investment of Rs. 750 crores. The complex will be set up at Hazira in Gujarat with a capacity to manufacture 270,000 tonnes of paraxylene and 200,000 tonnes of purified terephthalic acid per annum.

RIL has tied up with UOP Process International of the US to manufacture paraxylene and with ICI of the UK to produce purified terephthalic acid, according to industry sources. The company also has a firm buyback arrangement with ICI for its entire production.

According to sources close to the company, the project will earn the company Rs. 600 crores per annum in foreign exchange.

Though the company has not yet finalised the mode of raising finance for the product, company sources to not envisage any problem on that front. According to them, the kick-off date for the project is sometime in October, this year, and the project go on stream by the end of 1991.

Rs. 9.44-CRORE INCREASE IN OIL PROFIT

The public sector Oil India Limited (OIL) earned a profit before tax of Rs. 102.55 crores during 1988-89, an increase by Rs. 9.44 crores from 1987-88. The profit after tax was Rs. 86.56 crores during 1988-89, according to Oil India Limited's chairman-cum-managing director, Mr. Surajit Chaliha.

Mr. Chaliha said that the gross income of the company increased from Rs. 51,912 lakhs in 1987-88 to Rs. 53,359 lakhs in 1988-89. The interest income on investments and deposits also increased from Rs. 626 lakhs in 1987-88 to Rs. 1,316 lakhs in 1988-89 due to better management of investment surplus funds and better liquidity position, he said.

The gross internal resources generated by OIL increased from Rs. 20,82 lakhs the previous year to Rs. 21,36 lakhs, in 1988-89, he added. Mr. Chaliha said a total of 50,318 tonnes of LP was produced during the year exceeding the revised target of 50,000 tonnes.

However, the crude oil production of 2.424 million tonnes during the year was marginally lower than the revised target of 2.5 million tonnes, he said and added that in the last quarter of 1988-89 crude oil production reached a terminal rate of 2.64 MTPA.

Mr. Chaliha noted that despite many floods and agitations in the north-east, OIL exceeded the original target of 2200-standard line kilometres, (SLK) in seismic survey set for 1988-89 and achieved 113 per cent by shooting 24 SLKMs of seismic survey.

MICRONUTRIENT FERTILISER EXPORT UNDER OGL

The government has permitted export of micronutrient fertilisers and their mixtures under open general licence (OGL). But the export contracts have to be registered with the Chemicals and Allied Products Export Promotion Council.

The export of micronutrient fertilisers and their mixtures containing NPK, however, will be allowed "on merit".

A public notice amending the export policy was issued by the Chief Controller of Imports and Exports on August 22.



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Auxiliaries Manufacturers' Association: 36th Annual General Meeting

The 36th Annual General Meeting of the Indian Chemical Auxiliaries Manufacturers' Association was held at Bombay on 15th August 1989. Mr. H.C. Gandhi, Secretary (Tech. & Dev.), Ministry of Industries and Director General, DGTD, was the chief guest. The following is a summary (vide Chemical Weekly report dated August 29) of the proceedings.

Mr. S.K. Parekh's speech

Welcoming the chief guest Mr. H.C. Gandhi and others, the President of ICAMA Mr. Parekh said in part:

"While agreeing in principle with the Government's Policy of liberalising the Import-Export Policy to make available scarce raw material and to promote competitiveness and improvement in quality of goods, however, proper care is not taken to see that our own industry does not suffer because of large unnecessary imports of goods already being manufactured in the country. Also valuable foreign exchange is lost

because of unnecessary imports, the provision of flexibility in REP Licences of all the items of Appendix 3 have in effect nullified the intention of restricting the imports of items manufactured indigenously. Many finished products under the guise of raw materials are being imported against Advance Licences on which no import duty is leviable and such imports come to the market for sale which affect indigenous manufacturers of auxiliary chemicals directly, such as surfactants based on E.O., LAB and other alcohols, emulsions of silicone, polyvinyl acetate, plasticisers, etc. We, therefore, suggest that a strict monitoring on the imports of goods on Advance Licences should be made to avoid huge losses of scarce foreign exchange.

It is heartening that during 1988-89 India has exported chemicals and petrochemicals products worth: 1400 crores as against Rs. 860 crores during 1987-88 and the present trend is very favourable and encouraging. However,

due to certain problems export of auxiliary chemicals has not shown good performance as expected. We have, therefore, formed an export committee headed by one of our senior members, Shri M.D. Dhamankar, to look into the prospects and problems in respect of exports. Till the time we get the report, we would like to elaborate a few problems which have become stumbling blocks in the growth of exports. The main problem is of implementation of various concessions given by the Government for promotion of export e.g. the cash compensatory support was not available till 31.3.89. The same has been fixed from 1.4.89 but the rate of CCS is very low.

The CCS rate for organic surface active agents is 5% and for oil and well drilling mud chemicals (chemicals and petroleum exploration) it is 8%. If one takes into consideration the element of sales tax, octroi and packaging, high cost of electrical power and furnace oil, similarly high freight rate from India, then these supports look just petty. It is, therefore, our request to the Government to look into this and reconsider the rates of CCS which will be a real incentive to the exporter.

Secondly, it is observed that the list of products which are entitled for CCS covers most of the products of multinational companies whereas very few brand names of the indigenous companies appear in the list. In other cases like organic surface active agents, only six brand products are given whereas over 200 organic surface active agents and preparations can be exported. This also requires immediate attention of the Government.

Thirdly indigenous manufacturers are successfully supplying speciality performance chemicals to ONGC and Oil India Ltd., for more than five years. They have invested heavily in research facilities and dedicated equipment over the past ten years, to be able to indigenise these products. We, therefore,



The chief guest Mr. H.C. Gandhi is seen addressing the members of ICAMA. Others in the picture are from (L to R): Mr. S.K. Parekh, ICAMA President; Mr. C.D. Anand, Industrial Advisor, DGTD; Mr. L.N. Gandhi, First Vice-President of the Association and Prof. M.M. Sharma, UDCT.

request that ONGC and Oil India Ltd., should not issue international competitive bid tenders where developed indigenous sources of supply are available. It will not be out of place to mention here that in the current balance of payment crisis a single product namely Pour Point Depressant/Flow Improver could save Foreign Exchange worth more than Rs. 10 crores if the above mentioned policy is adopted.

Shortage of basic raw material

The year 1988-89 started with unprecedented increase in the prices of raw materials because of increase in the international price and decrease in the value of rupee compared to foreign currency. Also there has been a shortage of basic raw materials e.g. ethylene oxide, toluene, acrylic monomers etc., manufactured indigenously and on top of it the manufacturers, for reasons known to them, increased the price considerably.

This has affected our industries' production and also their export efforts. As it is not possible to import ethylene oxide, we have repeatedly made requests to DGTD to insist on M/s. IPCL and NOCIL to increase their production. We understand that both IPCL and

NOCIL are trying to increase their capacity for E.O. We request DGTD to recommend their case for faster implementation. We also suggest that items of perennial shortage like acrylic monomers, fatty alcohols, etc., should be allowed under OGL.

Central excise and customs

It is sad to note that classification lists, price lists are sometimes not approved for 2-3 years even though the classification lists are supposed to be approved within 3 months. This causes unnecessary hardship to the industry because it does not know its liability, if any, that may arise in future. Though, we must say that at the Collectorate level we get full assistance and co-operation and our Association has a representation on R.A.C. and Grievance Committee, problem areas are still there and we do hope that some ways will be found to settle this issue.

It is heartening to note that Jawaharlal Nehru Port (Nhava Sheva) has already become functional but not enough facilities are provided e.g. no facility for testing of chemicals is provided which can cause unnecessary delay and hardship to importers. Immediate action should be taken to

provide this facility. Also sometimes it is experienced that test reports take longer time than warranted. As the rupee is decreased in value, compared to foreign currency, Customs Duty should be accordingly varied so that the raw materials are available at a more or less constant prices.

Octroi

In spite of the commitment made by the Government of Maharashtra, Octroi has not been abolished which is very sad to say the least. Apart from that the samples of products for classification for octroi take considerable time and hence there is unnecessary delay at octroi naka. So steps need to be taken to test the samples within maximum period of one month. Speaking as the chief guest at the Annual General Meeting, Mr. Gandhi said, chemical auxiliaries play a vital role in the national economy and for development of several industries like textile, exploration, exploitation and refining of oil and gas, paint, paper, leather, plastic, pharmaceuticals etc.

As most of you would be aware, the year 1988-89 has witnessed an impressive growth of economy with significant contributions from major sectors like industry, agriculture and infrastructure. The industrial sector recorded a growth of about 9% during the year. Achievement of this growth just after the unprecedented drought which the country underwent, reflects the inherent strength and resilience of the Indian economy.

The industrial policy in the country is today directed towards liberalisation, fuller utilisation of capacity, productivity improvement, simplification of procedure and modernisation. A number of steps have been taken to accelerate the industrial growth, promote industrial dispersal and provide the industry with greater freedom in making investment decisions. These include broadbanding a number of industries so as to incorporate product mix horizontally, pre-



A view of the audience

scribing minimum rather than maximum levels of production in certain industries, technology upgradation and others.

The investment climate in the country today is indeed very good. In the earlier years, when industrial licensing policy was rather rigid, the number of industrial approvals was considered a good indicator of the investment climate. But with progressive liberalisation, the position has changed. The performance of stock exchanges and the amount of sanction and disbursement by the financial institutions is a good guide. During 1988-89, the amount raised through capital market is estimated at Rs. 4,544 crores as compared to Rs. 3,890 crores during the previous year. The sanctions and disbursements by financial institutions have also increased. During the year 1988-89, the sanctions have been of the order of Rs. 14,558 crores and disbursement Rs. 9,165 crores. The corresponding figures during the previous year i.e. 1987-88 have been of the order of Rs. 9,298 crores and Rs. 6,779 crores respectively. This is indicative of good investment climate in the country today. Entrepreneurs should make use of this conducive environment.

The chemical industry has shown a tremendous growth in the Seventh Five Year Plan and currently its share in the national growth is about 40% as compared to 8% during 1970-71. Further, the present annual growth of the chemical industry is also higher at 12.8%. India has become self-sufficient in major chemicals and has emerged as a potential exporter. I take this opportunity to share my thoughts on the 'Status of the Chemical Auxiliaries Industry in India and its future prospects'.

The demand of textile auxiliaries have gone up rapidly in recent years on account of large production of synthetic fibre in India and the world over. Spin finishes are required for man-made fibres like rayon, nylon, polyester, acrylics etc. being manufactured indigen-

ously. Special finishes required for water jet looms are being imported at present. There are about 15 major units in the organised sector engaged in the manufacture of textile auxiliaries. Their present level of production is about 12,000 tonnes valued at Rs. 55 crores.

The import of technology for the manufacture of textile auxiliaries is being allowed on merit. The developments in this field, in other countries like USA, Europe and Japan has been significant and great achievements have been made for specific applications with a lot of R & D efforts. It is desirable to catch up with the same. Thus, there is wide scope for undertaking the manufacture of specialised textile auxiliaries to meet the future demand of the Synthetic Fibre Industry. Further there is need to undertake extensive R & D efforts to upgrade the present level of quality and a better interaction between the consumers and manufacturers.

Leather industry has emerged as a vital export sector and the present annual exports are about Rs. 1,500 crores. The technology for leather processing is dependent on the developments of leather auxiliaries including those for the conversion of raw hides and skins into finished leather. The quality aspect is equally important. No doubt some units have established the production of leather auxiliaries with indigenous and imported technology, still India has to catch up with the developments that have taken place in the other developed countries in Europe. The import of technology is being allowed on merits.

As per report of the Sub-Group on Refining for the 8th Plan, the refining capacity likely to be available during 1990-91 and 1994-95 is 51.85 and 60.85 million tonnes respectively. Similarly, the crude oil production both onshore and offshore, from the known fields, as well as new fields has been estimated for 1994-95 at 16.97 and 27.80 million tonnes against Rs. 13.30 and 21.25 million tonnes during 1990-91. For achiev-

ing the targets, the requirements of oil field chemicals would increase tremendously.

A variety of speciality chemical additives and formulations are required for successful exploration and exploitation of oil and gas reserves. For the current planned programme of oil production and drilling activity of ONGC/Oil India Ltd., use of chemicals worth more than 100 crores per annum has been envisaged. As drilling and production activity will increase in future to achieve self-reliance in oil production, it is imperative to explore and exploit all the indigenous potential of chemical manufacturers to meet the increased demand for chemicals. From this consideration, the import substitution programme of chemicals, needs an urgent attention. It is also important, because it has international strategic significance. In order, therefore, to achieve good results in the import substitution programme, there has to be a constant exchange of ideas between the Indian Chemical Manufacturers and Oil and Natural Gas Commission/Oil India Ltd.

The indigenisation of petroleum industry has always occupied a place of prominence in the nation's list of priorities. The sheer size of this rapidly growing industry gives the Indian Chemical Industry ample scope for expansion. Here it needs to be understood that the demands of the programme are pressing and exacting and quality standards are stringent. Only the best components are acceptable and delivery schedules are important.

Oil well and oil field chemicals have been categorised as high technology areas. They require an in-depth knowledge of not only the manufacturing techniques for generic chemical products, but also their formulations to suit the ever changing needs of oil and gas producing industry. More so, because of different environments encountered from well to well and even in each well from time to time.

The Government is quite aware of the need to make available the required additives to users like ONGC and Oil India Ltd. and have therefore approved a number of foreign collaborations to bring in state-of-the-art technology. The foreign collaborators like Dresser Industries, Venture Chemicals, NL International and Henkel Chemicals all from USA and Enerchem from Switzerland have agreed to transfer their knowhow to the Indian companies.

Some of these foreign companies have even agreed to invest upto 40% of the equity capital in the Indian companies. However, it is noticed that some of the approved schemes have not made satisfactory progress, specially in the case of drilling chemicals. Though a large capacity for various items has been approved, Government would welcome licensing a few more units on merit. A number of Indian companies have done well in the oil field chemicals.

These companies are regularly supplying their products to ONGC and Oil India Ltd. and have met their stringent quality requirements. It is also heartening to note that South India Viscose are planning to manufacture lignosulphate based products utilising the waste from their paper plant in collaboration with Dresser Company of USA.

Coming to input/output norms, till 1988 the norms for supplies made to ONGC covered under 'Deemed Exports' and Actual Exports have been fixed on individual units requirements on an ad hoc basis. Subsequently, a Committee was constituted under DGTD to undertake study of the industry for fixation of the input/output norms. Based on the recommendations of the Committee, Government has announced input/output norms for PPD for three mud chemicals.

Oil field chemicals are covered in the list of Appendix I industry and are being treated as high priority area. Large and MRTP houses can enter in this field.

Foreign collaboration including equity participation is permissible.

The major raw materials required for chemical auxiliaries are available indigenously. However, due to shortage, imports of butyl acrylate, 2-ethyl hexyl acrylate, butanol, glycol, ethers etc. have been allowed to meet the gap between the demand and indigenous production.

Government have announced the minimum economic sizes for various chemicals such as methanol, formaldehyde, phenol, nitrobenzene, oxo-alcohol, polyols, MEG, LAB, phthalic anhydride, various polymers and synthetic fibres etc. However, the scale of production of chemical auxiliaries plant is quite low as compared to Europe, USA and Japan. This needs to be stepped up.

Export of chemicals during 1987-88 has been at the level of Rs. 1,300 crores and the target for the current year has been fixed at Rs. 1,900 crores. Thus, the chemical industry has great export potential and all efforts should be made to step up the exports.

I now come to certain specific points raised by the President Shri S.K. Parekh in his speech:

1. Regarding the flexibility for import of certain items under REP Licences covered under Appendix 3 list of Limited Permissible Items, the Government may consider shifting them to Appendix 2, part B List of Restricted Items provided they have a strong indigenous angle. The President may spell out the details of such items in view;

2. As the exports of auxiliary chemicals have not been encouraging, I am glad to note that a committee has been constituted with Shri M.D. Dhamankar of Hico Products to look into the export prospects and their problems. I would suggest that the report may be prepared within a month's time so that DGTD could immediately initiate action; and

3. Regarding the shortage of basic raw materials such as ethylene oxide, toluene and acrylates, the import of acrylates has already been allowed. DGTD has already impressed upon the indigenous manufacturers like IPCI, NOCIL and India Glycol Ltd. to step up the production of ethylene oxide as import is not feasible it being an explosive material. No doubt there has been world-wide shortage and steep increase in prices of petrochemicals during 1988 but I understand that the situation has stabilised now".

Prof. M.M. Sharma

Prof M.M. Sharma of UDCT, in his short talk suggested that the Association be rechristened as "Indian Speciality Chemicals Manufacturers Association" to reflect the correct nature of member activities. He enumerated the large scope for textile auxiliaries and speciality chemicals.

Honourable Members

Prof E.H. Daruwala, Ex-Director UDCT and Prof M.M. Sharma have been made Honourary Members of the Association.

TWO PER CENT OF GNP TO BE ALLOCATED FOR R & D

The Centre proposes to allocate two per cent of the Gross National Product for research and development in the Eighth Plan, Union Minister of State for Science and Technology Mr. K. Narayanan said.

Talking to newsmen at Trivandrum he said that only Rs. 6,500 crore which was one per cent of the GNP, was earmarked for R and D in the Seventh Plan.

Mr. Narayanan said the proposal of doubling of the allocation for R and D activities would create a "spectacular impact" in the field of science and technology.

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Detergent prices to go up

Detergent prices will go up by 50 paise to one rupee a kg in tune with the increased price of linear alkyl benzene (LAB) announced by Reliance Industries Ltd., (RIL) and Tamil Nadu Petroproducts Ltd. (TPL).

A five to eight per cent price hike, depending on the LAB content of the finished product is inevitable, according to Indian Soaps and Toiletries Makers Association (ISTMA). RIL and TPL have increased price of LAB by Rs. 4,000 to Rs. 27,000 a tonne.

While the Government restrains soap producers from raising prices of popular brands, it is regrettable that no such discipline is being imposed on LAB producers, one manufacturer said.

According to ISTMA, the price of kerosene and benzene, raw materials for LAB, increased marginally by around four per cent. "Even if one considers the higher cost of utilities, a price increase beyond five per cent on LAB is not justifiable", ISTMA claimed.

ISTMA has alleged that RIL and TPL appear to have taken advantage of the temporary shortage which has emerged in the market due to the prolonged shut-down of Indian Petrochemicals Corporation Ltd. (IPCL) plant and the damage to the LAB plant of Reliance at Patalganga.

Mr. Menon said the price increase would adversely affect the synthetic detergent industry which would be compelled to increase detergent price by at least five to eight per cent depending on the LAB content in the end product. Consumers would have to shell out upto Re. 1 for kilo extra.

BARC BREAKTHROUGH IN FUEL FABRICATION

A major breakthrough has been achieved in fuel fabrication by the

Bhabha Atomic Research Centre (BARC) with the completion of the latest 'Kamini' sub-assembly comprising plates of aluminium-clad uranium-233.

Disclosing this to newsmen at Bombay on August 28, Dr. S. Ganguly, who heads BARC's Radiometallurgy Division, said the breakthrough would enable India to successfully implement the third stage of its nuclear power programme, though he conceded that it would take at least two more decades before this technology is perfected and found its application on a commercial scale.

Uranium-233, described as the most efficient fissile material, is produced from the naturally occurring thorium-232, of which the country has abundant reserves totalling more than 360,000 tonnes, he said.

Dr. Ganguly said "Kamini", a 30 kwt light water reactor, is the first of its kind in the world to use uranium-233 bearing fuel expected to go critical by the year end. It is being set up BARC scientists and engineers at the Indira Gandhi Centre for Atomic Research at Kalpakkam in Tamil Nadu for neutron radiography experiments.

The major fabrication of its fuel sub-assembly includes master alloy preparation, hot and cold rolling of fuel meat in aluminium picture frame and roll bonding, he said. Aluminium has been chosen because of its low thermal neutron absorption, low cost, ready availability, fabricability, strength, excellent irradiation behaviour and corrosion resistance in water.

MAGNETITE FOR SEWAGE TREATMENT

Scientists at the Commonwealth Scientific and Industrial Research Organisation (CSIRO) have developed a

quicker and cheaper method of sewage treatment using magnetite. It was found that magnetite, a fine powder, could not only absorb heavy metals but could also attach itself to most of the organic matter in raw sewage.

Magnetite can clarify raw sewage in about 20 minutes, 20 times quicker than the conventional technique. A sludge about 40 times more concentrated than raw sewage remains, and this can be speedily digested at elevated temperature in a compact anaerobic digester. The magnetite can be magnetically separated and reused.

KVIC PLANS MORE BIOGAS PLANTS

The Khadi and Village Inds. Commission (KVIC) has planned to construct one lakh biogas plants during the year. KVIC has installed over 165,000 plants so far which could produce annually, fuel worth Rs. 3,801.81 lakhs and manure worth Rs. 1,249.92 lakhs.

RAMA PETRO

Rama Petrochemicals has recommended a maiden dividend of 15 per cent for 1988-89, absorbing Rs. 145.43 lakhs. The company which commenced commercial production of methanol from the middle of April 1988 has achieved 100% capacity utilisation in the very first year of operation and the turnover during the period amounted to Rs. 42.71 crores and production and despatches of methanol during the period were 54,700 tonnes and 53,510 tonnes respectively.

The company has earned a gross profit before interest of Rs. 10.15 crores. The interest charges amounted to Rs. 356.90 lakhs. The profit after interest and depreciation amounted to Rs. 302.50 lakhs. After the proposed dividend Rs. 100 lakhs has been transferred to the general reserve and the balance Rs. 57.07 lakhs has been carried forward.

BPCL's xylene project likely to be stalled

Bharat Petroleum Corporation Ltd. (BPCL) has withdrawn its Rs. 384-crore refinery downstream integration project just before it was to go to the Public Investment Board. Officials of the Board say that BPCL's action follows pressure from the Ministry of Petroleum exerted on behalf of Reliance Industries Ltd. (RIL) says a Financial Express despatch.

With the collapse of this project to make xylene from naphtha, Reliance stands to control the Indian market in paraxylene, the petrochemical intermediate used to make both DMT and PTA, which are in turn used to make polyester fibre and yarn. Bombay Dyeing, its textile competitor, will have to continue to import 42,000 tonnes of paraxylene every year to make DMT — rising to 60,000 — or be greatly at the mercy of Reliance.

BPCL's project has been long delayed. Originally proposed in the Sixth Plan (1980-85), it carried on into the current Plan, the Seventh. The final application was made to the Government in 1986. Immediately a wrangle broke out with the Ministry of Environment, reportedly following fierce lobbying by RIL.

Bharat Petroleum finally obtained environmental and pre-Public Invest-

ment Board clearances in the course of 1988-89. It only remained for it to go up before PIB, which is made up of the secretaries and financial advisers of the Economic Ministries and representatives of the Planning Commission, and chaired by the Secretary (Expenditure) in the Ministry of Finance.

BPCL proposed to set up its xylene plant at its Mahul refinery complex, where nearly seven million tonnes of crude oil is processed, in the outskirts of Bombay. It would have consumed about 200,000 tonnes of naphtha a year from Bombay High and other crudes, to produce about 100,000 tonnes of xylene, principally paraxylene.

The internal rate of return (IRR) worked out to about 20 per cent, assuming the present duties on paraxylene imports. The foreign exchange component of the Rs. 384-crore project cost would have been Rs. 76 crores. The world over, benzene, toluene and xylene — 'BTX' — are extracted from naphtha, in aromatics plants. In Bharat Petroleum's Bombay Refinery only an incomplete extraction is carried out of benzene and toluene alone. This is because of the imperatives dictated by Reliance's requirements for its Patal-ganga complex.

RIL was licensed to produce 75,000

tonnes of PTA, which has been surreptitiously increased to 192,000 tonnes. This consumes 136,000 tonnes of paraxylene from about 220,000 tonnes of naphtha. Naphtha was a stand-by allocation from BPCL — with a categorical provision that it would end the moment its own xylene plant came up.

But any chance of that happening was prevented by the fact that RIL has set up its own xylene plant. Mr. Dhirubhai Ambani has claimed that he needs licence to manufacture xylene, since these are only an intermediate to his PTA production. Yet Indian Petrochemicals Ltd. (IPCL) and the Bongaigaon Refinery have thought it worthwhile to licence their capacity to manufacture paraxylene for captive consumption.

Yet Reliance has, it has been claimed secretly, installed a xylene plant well in excess of its own captive requirement — of more than 180,000 tonnes instead of 136,000 tonnes (and even that was unlicensed). As a result it will have a tradable surplus of about 44,000 tonnes of paraxylene.

Bombay Dyeing today imports 42,000 tonnes of paraxylene. IPCL which imports to meet a part of its requirement, will soon expand its capacity to 48,000 tonnes, whereupon it will have a trading surplus of 24,000 tonnes of paraxylene. But Reliance, will pos-

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ess 440,000 tonnes of paraxylene which it can trade — controlling, therefore, nearly two thirds of the market.

RIL's ghost paraxylene plant has come, uninvited to BPCL's banquet, and spoiled its feast. Because it will require nearly 300,000 tonnes of naphtha, it pre-empts that amount which would otherwise have been consumed by Bharat Petroleum's own project. RIL has had the political clout to make its stand-by allocating a permanent one.

"This is one more instance of the public sector being sucked dry by the private", argue officials in Delhi. The integration of refinery operations so that maximum value is added by the primary refiner is a basic principle. The refinery company should not, they claim, be compelled to leave the production and marketing of secondary products to those who will skim off the cream of profits.

"Moreover it should be accepted that the economy as a whole should not depend on a single supplier. If the project turns out to be unprofitable let the BPCL management be held responsible. But let them put up their plant and market their product. After all, it is a separate company under the Companies Act and don't tinker with duties just to suit RIL."

All this is strongly refuted by BPCL sources who say that the project is unviable today. This is because the scale of the project at 100,000 tonnes is too low to be comparative. The IRRs are around 20% with the present duty structure on imports around 120%. If this is relaxed to a low 40% — the breakeven point — the viability collapses. The IRR drops as low as four per cent.

Given IPCL and Reliance's likely production, argue company sources, it is likely that there will not be a market in India for Bharat Petroleum's paraxylene. In that case, BPCL would have to export, and its exports would have to

be below cost, they argue, in a world market where prices fluctuate violently, and large, economical plants dominate. Yet surely if Bharat Petroleum put up a xylene plant, its naphtha could not be taken for granted by RIL. Then why should one assume that RIL will compete with BPCL's paraxylene?

BPCL sources also point to the no-risk Rs. 3 crores profit which the company earns from its naphtha sale to RIL, contrasting it with the competition of the xylene market. Last, they seek to emphasise that RIL exerted no pressure on their company.

HINDALCO ALLOWED TO SET UP NEW UNIT

The Union Government has allowed the Birla-owned Hindustan Aluminium Corporation Ltd. (HINDALCO) to set up a new unit for making aluminium foils. The Rs. 69.95-crore unit will be set up in Jagdishpur, district, Sultanpur,

Uttar Pradesh. According to official sources, the new unit, namely, National Foils Ltd., will produce 5,000 tonnes per annum of aluminium foils. The unit is being set up in association with the Pradeshiya Industrial and Investment Corporation (PICUP).

The project will be financed through participation by PICUP, HINDALCO and the public in addition to foreign exchange and rupee loans. In fact, PICUP will have an equity participation of 11%, HINDALCO 25% and the public will account for 64%. In other words, PICUP will contribute Rs. 2.57 crores, HINDALCO Rs. 5.83 crores and the public Rs. 14.92 crores.

About Rs. 23.93 crores will be raised through foreign exchange loans, Rs. 16.81 crores by way of rupee loans from financial institutions, Rs. 5.59 crores as unsecured loans subordinate to equity from promoters and the balance will be through capital subsidy.

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Pilot scheme to use plastics in farm sector

The Union Government has prepared a pilot scheme for promotion of plastics in agriculture. Under the scheme, known as the 'Plasticulture District Programme' (PDP), 16 districts have been identified, based on their agro-climatic conditions. The government proposes to spend Rs. 55 crores on this project allowing for Rs. 3.5 crores for each district. Under the programme, the government proposes to provide suitable incentives to the farmers in these districts for using plastics in agriculture.

According to Mr. M.S. Gill, secretary, department of chemicals and petrochemicals, the use of plastics in agriculture leads to better productivity and conservation of scarce water. He told newsmen at New Delhi, on Aug. 25, that the newly constituted national committee on the use of plastics in agriculture (NCPA) was aware of the need to prevent destruction of forests. One of the substitutes for wood, therefore, was the use of plastics.

He maintained that miraculous development in agriculture and horticulture in the US, Western Europe, China and Japan, had become possible through the use of plastics. This could be replicated in India as well.

For example, plastics could be used in packaging farm produce. At present about 26 million cubic meters of wood was being used for this purpose involving a transit loss of 15 to 40 per cent, valued at about Rs. 3,000 crores. Mr. H. Shah, chairman, Indian Petrochemicals Corporation Ltd. (IPCL), who was present at the conference, said that a beginning had already been made to replace wooden boxes by plastic crates for storage in transportation of fruits and vegetables in Himachal Pradesh, J & K and Punjab.

About 30,000 crates had been supplied free of cost on a trial basis. Another 25 lakh crates were proposed to be supplied to different states with a

revolving fund of Rs. 10 crores. The Oil Industry Development Board (OIDB) had provided Rs. 5 crores to meet the cost of the crates which would be subsidised for the farmers.

Mr. Shah explained that with a view to popularising the importance of using plastics in agriculture, India would be hosting an international congress on the subject from Feb. 26 to March 2, next year. The theme of the congress would be relevant technology transfer on use of plastics in agriculture.

Likewise, for the first time an international plastics exhibition and conference would be held in India next year. A number of manufacturers and experts from leading international organisations in the US, Europe and the Far East, would attend the meet.

MOVE TO BAN IMPORT OF PLASTICIZERS

Leading producers of plasticizers are lobbying for a ban on imports. They have had discussions with officials in the presence of polymer producers and a section of the consuming industry. Another round of talks are to take place shortly. Plasticizers are mostly derivatives of phthalic anhydrides, which are added to PVC to render the "plastic" (soft, flexible). The major consuming industries are manufacturers of PVC compounds used for producing cable sheaths and PVC clothes.

The last three years have seen the entry of many small units which has led to the creation of an estimated capacity of 1.4 lakh tonnes of plasticizers. The demand is estimated to be less than 50,000 tonnes. The producers have been hurt by a ban on import of octanol which goes into plasticizers like di-isooctyl phthalate (DIOP). There are only two producers of octanol and the production is insufficient to meet the demand. Ad hoc imports are allowed, but the high import duty acts as a dis-

incentive, indeed, the quality of wire and cable compounds have been deteriorating because many processors have been using cheaper substitutes. Processors are worried over the move to ban import.

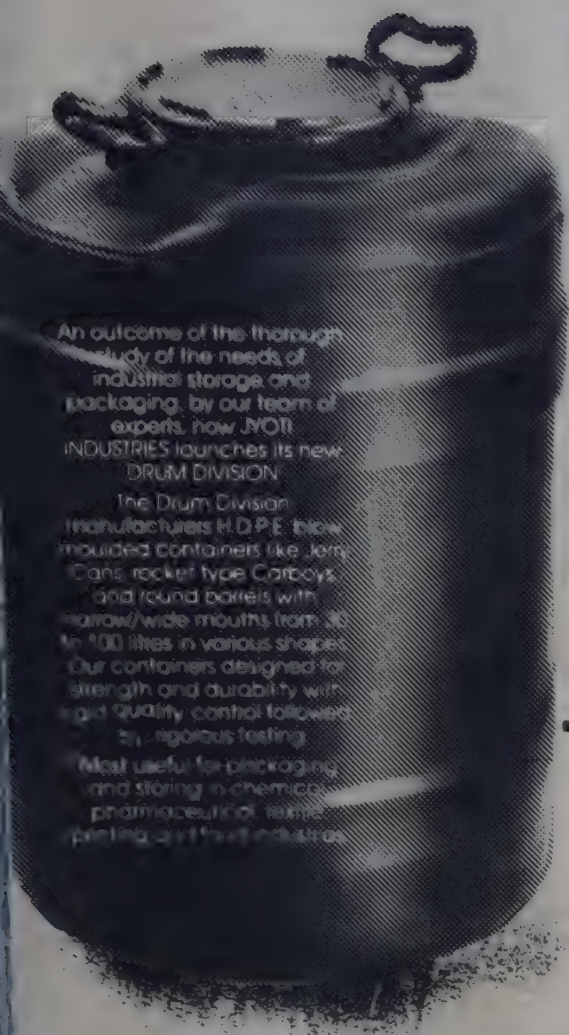
VAM ORGANIC PROJECTS FOR HDPE & LLDPE REJECTED

The Union Government has rejected two proposals of Vam Organic Chemicals Ltd., involving an investment of Rs. 300 crores, for making petrochemical products. The proposals have been rejected on the ground that the feedstock has neither been tied up nor assured. One of the Vam Organic projects related to the manufacture of high density polyethylene (HDPE) and linear low density polyethylene (LLDPE) in Uttar Pradesh. The project was envisaged to cost Rs. 280 crores.

As per the proposal, the company planned to set up a new undertaking at Auriya for making 2,00,000 tonnes per annum of HDPE and LLDPE. The company hoped to raise resources for its project through the issue of equity capital and debentures, by raising loans from financial institutions, foreign exchange loans and from internal accruals. Vam Organic, incidentally, is a dominant manufacturer of vinyl acetate monomer (VAM).

According to official sources, the company had applied for permission to set a new unit to produce 10,000 tonnes per annum of nitro aromatics. This project, involving an investment of Rs. 20 crores, was planned to be set up at Gajraula in Uttar Pradesh. The product range included nitrochlorobenzenes, dichloronitrobenzene, nitrobenzene, nitrotoluene, mono nitro cumene and ethyl hexyl nitrate.

The company planned to raise resources for the project through the issue of debentures, loans from financial institutions, foreign exchange loans and internal accruals.



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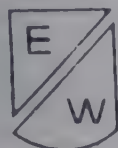
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RIL's PFY project approved

The Union Government has cleared proposal of Reliance Industries Ltd. for the manufacture of polyester filament yarn under the broadbanding scheme. The project involves an investment of Rs. 20 crores.

Likewise, another RIL proposal for endorsement of paraxylene capacity for purposes of merchant sale, has been cleared. This is on the industrial licence held by RIL for making one lakh tpa of purified terephthalic acid (PTA) at Talanganga, Raigad, Maharashtra. The endorsed paraxylene capacity for merchant sale is 67,000 tonnes per annum (tpa).

In the case of the first project, the government has allowed RIL to manufacture polyester filament yarn under the description polyester staple fibre (PSF) and polyester filament yarn (PFY) within the existing capacity of 5,000 tpa of PSF. The approval has been given under the broadbanding scheme.

The company proposes to raise funds for the project through internal accruals amounting to Rs. 4.5 crores, foreign exchange loans from financial institutions: Rs. 10.5 crores and the issue of debentures and rupee term loans amounting to Rs. 5 crores. The government has specified that the company

should raise at least 50% of the proposed rupee borrowings through the issue of debentures to public on rights basis.

RIL had, in its application, contended that its proposal involved additional investment for procuring certain balancing equipment. According to official sources, RIL was told that this investment should be within ten per cent of the existing book value of its plant relating to the manufacture of PSF. The company was asked to finalise the details of investment.

The company on its part furnished a certificate from its chartered accountants indicating that the book value of its PSF plant, machinery and equipment amounted to Rs. 200 crores. Accordingly, it said it would invest Rs. 20 crores for purposes of broadbanding. In the case of the paraxylene project, RIL had said that it was manufacturing PTA from the naphtha stage. Paraxylene is an intermediate produced for making PTA. No separate licence for its manufacture was required by RIL as it was purely for captive consumption.

The company further stated that the operation relating to the manufacture of paraxylene for PTA was a complex one and prone to breakdown. In such contingencies, the PTA section has to be shut down while the paraxylene section

can continue to operate. RIL accordingly requested for endorsement of paraxylene capacity for merchant sale. It further contended that if the PTA plant ran to its full capacity, no surplus paraxylene capacity would be available.

The government agreed with the argument though it said that the capacity to be endorsed for merchant sale should be the quantity related to the approved capacity of PTA. The approval however, is subject to the fact that RIL will not make any additional investment for implementing this proposal.

SUMITRA PHARMACEUTICALS

Sumitra Pharmaceuticals & Chemicals Ltd. entered the capital market on August 28, 1989 with an offer of 14,40,500 equity shares of Rs. 10 each for cash at par to Indian public. The subscription list will close on Sep. 7, 1989 or earlier but not before Aug. 31, 1989. The company is seeking enlistment of its shares on Ahmedabad, Bombay, Delhi and Hyderabad stock exchanges. The company is setting up a Rs. 6 crores plant with a capacity to manufacture 300 tonnes of ibuprofen and 50 tonnes of mebendazole per annum. Ibuprofen is used in analgesic and antipyretic drug formulations and mebendazole is an antihelminthic drug. The plant is located at village Kohir Mandal, Medak district, Andhra Pradesh.

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Clearance for Hazira heavy water project

The heavy water plant, being set up at Hazira in Gujarat, has been, accorded clearance by the Union Ministry of Environment and Forests.

With the approval granted early last month after a detailed scrutiny, Hazira project, based on the mono-thermal ammonia-hydrogen exchange process, is expected to be completed on schedule by the end of 1990.

Detailed engineering, civil and structural works and order of equipment and machinery have been completed and the fabrication of equipment is in progress. Delivery of machinery equipment and piping materials is continuing.

The project is of prime importance to the nuclear power generation programme as heavy water is used as the moderator and coolant in the pressurised heavy water reactors (PHWR). One of the main objectives of the Department of Atomic Energy is to make the country self-sufficient in heavy water for use in nuclear power plants as not only are the sources of supply limited but the product also falls under international safeguards which includes conditional clauses such as the return of reactor waste plutonium.

Although the country has seven heavy water plants at Nangal, Baroda, Tuticorin, Kota, Talcher, Thal and Manguru, some of them under various stages of commissioning, self-sufficiency has not as yet been achieved.

In fact, some of the plants have been working at levels far below the installed capacities or are under forced shutdown on account of accidental fires and other mishaps. In some cases, sabotage is said to be a distinct possibility and this is supported by the fact that supplies from abroad have been lost in the high seas.

The clearance of the Hazira plant, understandably, is subject to very strict conditions as the product is radioactive.

The Ministry has, therefore, noted that the project authority must strictly adhere to the stipulations made by the pollution control boards concerned, failing which the clearance may be revoked.

The Ministry has stipulated that gaseous emissions should not exceed the maximum limit prescribed and at no time should the level be beyond the given standards. In the event of failure of any of the pollution control systems adopted by the unit, it should be put out of operation immediately and not restarted until the control systems are rectified to achieve the desired level of efficiency.

Further, the quality of liquid effluent generated within the various operations must be recycled to the maximum extent possible. The effluent from the heavy water complex should strictly conform to the prescribed standard before discharge into any system.

The authorities must discharge rejects from reverse osmosis and electrolysis in properly lined tanks and evaporated before final disposal.

The most stringent conditions are with regard to air, water and weather monitoring. The authorities must set up a minimum of five mechanised weather monitoring stations and automatic air quality monitoring stations at different locations of the plant and nearby areas.

The air quality monitoring stations which should include the monitoring of hydrocarbons, have to be set up after detailed modelling exercise for presenting short-term ground level concentration.

All the stacks of the plant must be provided with continuous automatic stack monitoring equipment and the emission levels have to be recorded and submitted to the State Pollution Control Board once in three months and to the Union Ministry half-yearly.

A minimum of eight water quality monitoring stations have to be set up at different locations and the effluent disposal tank is to be provided with a continuous monitoring system for ammonia and nitrogen.

The authorities must provide a standby ammonia stripping system and the limit of ammonia should be kept at the minimum. The waste water should in no case be discharged into the creek, while a green belt of five hectares with a minimum density of 2,500 trees per hectare has to be developed.

ABL COMMISSIONS FUEL BOILER FOR KHAMMAM REFINERY

ACC Babcock Limited, which is in the process of being revived under a BIFR package, recently commissioned a fuel boiler for the Khammam Chemical Refinery, a project of the Department of Atomic Energy.

This the first major success of ABL, after it resumed operation in June last year, in executing its outstanding orders.

The fuel boiler, commissioned on August 21, is part of the contract for three boilers which ABL has to execute on a turnkey basis for the Khammam Chemical Refinery.

Each boiler is to have a capacity to raise 265 tonnes per hour of steam and has to be fitted with electrostatic precipitators to ensure almost total cleaning of flue gas. The commissioning schedule for the second unit is December and that of the third unit is May 1990.

The other orders, execution of which during 1989-90 is being given priority by ABL, include erection and commissioning of boilers for Kolghat Thermal Power Station, Bhadrachalam Paperboards Limited, Mandya National Paper Mills and Ballarpur Industries Limited.

Australia offers coal know-how

Australia has offered India, technology for reducing the production cost of coal and improving efficiency and productivity in the coal sector. The offer was made at the first meeting of the India-Australia joint working group on coal, held in Canberra, recently. The main objective of the working group is to identify projects and activities in the Indian coal sector for bilateral cooperation with Australia to facilitate induction of Australian mining technologies.

India has indicated that induction of Australian technology would be facilitated if it was funded by concessional finance. The Indian delegation to the meeting was led by Mr. T.U. Vijayasekharan, Secretary, Department of Coal. The delegation visited some open-cast and underground coal mines in Australia.

The system of continuous mining with shuttle cars for coal retrieval, commonly known as the Wingaswillie

System, which helps speedy coal production with a good recovery percentage, is considered to be of potential applicability in India's underground mines. Rock-reinforcement, practised in Australia with mechanised cable and bolt roofing, would also help in increasing coal production without loss of men or equipment, the Australian side claimed.

The other areas considered for possible bilateral cooperation included evaluation of coal, computer-aided mine planning, design and operations, productivity improvement, training programmes for various operations, and site rehabilitation in large open-cast mines.

Outlining the developments in the Indian coal industry over the past 20 years or so, and plans for doubling of raw coal production from 210 million tonnes in 1989-90 to 400 million tonnes by the year 2000 AD, Mr. Vijayasekharan told the Australian side that India

was looking forward to the introduction of new and advanced technologies and systems for achieving production targets and reducing the unit cost of production.

SOLAR ENERGY CONSORTIUM IN MAHARASHTRA FORMED

Manufacturers, researchers, promoters and users of renewable energy technology in Maharashtra have formed Maharashtra Solar Energy Consortium to overcome the common difficulties promoting the new concept. Renowned physicist V.G. Bhide, who is the former Vice-Chancellor of the University of Pune, was elected chairman of the consortium's steering committee, at a foundation meeting at Pune recently.

The consortium would be registered under the society's act and would provide an umbrella for researchers, universities, manufacturers, voluntary organisations, nodal agencies and users. It would enable them approach policy-making authorities like the Department of Non-Conventional Energy sources or the Planning Commission to get their problems sorted out according to Bhide.

He said that at least 35 manufacturers had responded to the efforts of the Maharashtra Energy Development Agency since its formation in 1985. It had undertaken the production of water heaters, cookers and dryers. Although there had been a response to these products, there were certain problems to be sorted out, the one related to the maintenance period of guarantee.

ONGC STRIKES GAS, OIL IN RAJASTHAN

Two natural gas and oil fields have been discovered by the Oil and Natural Gas Commission (ONGC) in Chittorgarh and Manhar Tibba in Rajasthan. ONGC (Baroda) spokesman said that ONGC, which has made remarkable progress in crude oil and natural gas production in Gujarat, had extended accelerated exploratory efforts in the neighbouring state of Rajasthan.

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CCS disbursement through banks soon

Cash Compensatory Support (CCS) will be distributed through banks in a couple of months, according to Mr. Dinesh Singh, Union Minister for Commerce. Addressing the Federation of Kamataka Chambers of Commerce and Industry (FKCCI) at Bangalore on August 20, Mr. Singh noted that this procedure had been agreed upon by the commerce ministry although the banks had expressed a little nervousness at the idea. The banks had urged the ministry to indemnify them in case of wrong payments and the Ministry was presently considering the matter.

Mr. Singh noted that the Commerce Ministry was also simplifying the export procedures to make it a one time operation. The Chief Controller of Imports and Exports was evolving a computerised set of forms, which would considerably cut down the paperwork. While several loose ends were still to be tied up, the Ministry was hopeful of introducing these forms very shortly.

Mr. Singh exhorted the exporters to exploit the market of the Asian part of the Soviet Union, which had opened up tremendously in recent years, especially, in the areas of consumer goods and industrial machinery. He pointed out that India had recently secured a Rs. 300 crores order from the Soviet Union for pharmaceuticals in addition to the normal trade between the two countries. He noted that while the European part of the Soviet Union would look for trade with European countries, the Asian part would be receptive to goods from India. He suggested that India could also consider joint collaborations with the Soviet Union as these ventures not only ensured joint interest but also a secure market.

Mr. Singh noted that India had so far been concentrating on exporting to the western countries and had not paid adequate attention to markets in south-east Asia, Australia, China and Africa. Now with the growing opportunities for

access to larger markets, India could build a firm base for exports to these areas, he felt. However, if India was to compete globally, certain restrictions would have to be removed, industries would have to grow to larger size to achieve economies of scale as with their present size, it was difficult to be globally competitive he said.

Mr. Singh noted that while the government had been giving several incentives to exporters to compensate international disadvantages, this support could not be long-term in nature. Industries would have to become self-reliant by either going in for local manufacture of the imported inputs or alternative exports to enable them to earn the required foreign exchange to cover imports. He emphasised the need for exporters to go beyond domestic markets and create an international market for their goods.

Mr. Singh stated that Indian industries had reached economic growth, where the private sector itself could provide the necessary infrastructure for further growth. The private sector now had an opportunity to enter fields such as energy and transport he said. Mr. M. Panduranga Setty, president of FKCCI suggested that the Union Ministry of Commerce should urge the Ministry of Railways to expedite the doubling of the track of the remaining Whitefield-Kuppam sections along with the completion of the electrification from Jolarpettai to Bangalore.

MODI CLOTH

Modi Cloth Mills, a unit of Modi Spinning and Weaving Mills Co., is to achieve a projected turnover of Rs. 40 crores in cotton and viscose exportable fabrics, super softex towels, cotton and blended curtain fabrics and canvas. The company at present processes 80,000 m. per day of fabrics for ready-made garments for export purposes.

TAKING OVER MADRAS PETROCHEM

IDBI begins talks with MRL

The Industrial Development Bank of India (IDBI) has initiated discussions with Madras Refineries Limited (MRL) on the feasibility of the latter acquiring Madras Petrochem Limited located at Manali near Madras. The IDBI has also been approached by a few private sector parties including Essar for taking over Madras Petrochem, a unit for blending, refining and processing of petroleum and other oils. The unit is now under the management of financial institutions with IDBI as the lead institution.

Discussions have been opened with MRL because IDBI feels there is considerable synergy between the two. The unit is located alongside MRL, has a pipeline, and has 55 acres of land on which MRL can put up units for diversification. But the main problem seems to be in what manner the shareholders of Madras Petrochem, which was launched in 1969 as a private sector unit, should be compensated. Formerly known as Nagpal Ambadi Petrochem Limited, the unit was promoted by a Bombay-based businessman — late Mr. Richard Nagpal.

The financial institutions took over its management in 1978 when the unit fell deep in the red with an accumulated loss of Rs. 5 crores. Since then the financial institutions have been holding 40 per cent of the total equity stake of Rs. 2.9 crores and the rest by the public. The company has not paid any dividend since its inception.

Madras Petrochem, which has been suffering cash losses for the last two years, has in compliance with the provisions of Sick Industrial Companies Act notified the Board of Industrial Finance and Reconstruction (BIFR) and sought a revival package. The company has said it is not possible to operate the unit without further infusion of funds of at least Rs. 250 lakhs by way of loans and working capital. Since a heavy interest liability has already been built up, the financial institutions are not keen to pump in additional money.

Hence the rehabilitation of the unit should be facilitated and the takeover can be by any "forward looking" company. It has also suggested that the takeover should also provide for some kind of compensation to the minority shareholders.

For all its dismal performance over the years, the unit is not a decrept one. Its equipment supplied by the leading American firm Witco is the best among all units which later came up in the small-scale sector, though it is run down now due to lack of maintenance.

The unit, with an annual installed capacity of making 18,750 tonnes of transformer oil, 10,000 tonnes of specialist oils, and 20,625 tonnes of sulphuric acid - oleum, has a very good market for its products. But it cannot cash in on the situation because it does not have adequate working capital. The unit needs money to buy the feedstock

which is available from the public sector units like the Indian Oil Corporation only on advance payment. At the same time it has to offer extensive credit, ranging from 45 to 60 days to its customers mainly public sector units like state electricity boards and Bharat Heavy Electricals Limited.

The company incurred cash losses mainly because of two reasons. The first is that its competitors cut the price of petrochem sulphonate by Rs. 5,000 per tonne because of the competitive market situation leaving no option for Madras Petrochem but to follow suit. Secondly, the imported feedstock supplied to the unit was not to the required quality as a result of which the quality suffered leading to lower sales. The unit however turned out to be a jinxed project from the start. A policy change by the government in 1971 resulted in a number of small-scale units coming up in the field with a total capacity of 75,000 tonnes of transformer oil and 34,000 tonnes of petroleum products.

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UB likely to bag naphtha cracker project

UB Group Chairman Mr. Vijay Mallya expects to get Government approval for its ambitious naphtha cracker project at Visakhapatnam in Andhra Pradesh shortly. The flamboyant industrialist believes the green signal is coming chiefly because the Centre had "recognised the merits of the project".

The financial plan for the complex has been submitted to the Finance Ministry, and according to Mallya, the Ministry had not asked for any modification or clarification, indicating the feasibility of the project. About seventy-five per cent of the naphtha requirement of the plant will be sourced from the Vizag refinery.

If given the go-ahead, the UB Group will be the third private sector company to be given a licence to crack naphtha, to be used for downstream petroproducts such as polyethylenes used by the plastics industry. Linde of West Germany has been given a conditional licence to undertake this process along with the RP Goenka Group. The project is yet to be implemented.

Earlier, Reliance Petrochemicals received the permission to operate a cracker plant at Hazira. However, the process is based on both gas (from Bombay High) and naphtha. Indian Petrochemicals Corporation is the only public sector unit whose gas cracker complex is nearing completion at Nagothane in Maharashtra. NOCIL and Union Carbide (at its Chembur plant, taken over by the Oswal Group recently) have capacity for this process based on ancient technology.

Meanwhile, the UB group as per the declared intention of Mallya to widen its shareholding base by gradually opening up for public participation its 100 or so fully-owned subsidiaries, is increasingly turning to the capital market to finance its requirement. In September, it is offering to the public 98,00,000 shares (of Rs. 10 each for

cash at par) of UB Petroproducts', a joint venture with Tamil Nadu Industrial Development Corporation and an Italian company. Next in line, Mallya hints, is UB Elastomers, another Group company, to finance its Rs. 360-crore butyl rubber project, which will be the only one of its kind in India.

The Rs. 1,000-crore turnover UB Group, involved in liquor and beer, petrochemicals, pharmaceuticals, paints, processed foods, engineering, electronics, telecommunications and energy, may be coming out with another mega issue for public consumption if the naphtha cracker project, based on naphtha sourced from Hindustan Petroleum's refinery at Vizag gets cracking, as per his expectation.

A later report adds:

The Project Approval Board (PAB) has cleared the establishment of a cracker plant at Vishakhapatnam. The Rs. 2,000-crore project, based on naphtha, is proposed to be set up by the United Breweries group under Vijay Mallya. The proposal has now gone to the Cabinet Committee on Economic Affairs (CCEA) for final approval.

The PAB decision was taken late in July, but was kept under wraps, according to official sources. Of the three cracker plants that are proposed to be set up during the Eighth Plan, two are based on gas and one on naphtha. The government has already cleared a gas cracker at Hazira, to be set up by Reliance Industries. The other one at Auriya is expected to be set up either by the Gas Authority of India Ltd. (GAIL) or by the Indian Petrochemicals Corpn., Ltd., (IPCL). The three cracker plants would take care of 50 per cent of the proposed investment of Rs. 12,000 crores in the Eighth Plan in the petrochem sector.

The capacity of the mother cracker plant at Vizag would be around 3,00,000 tpa of ethylene, 1.8 lakh tpa of

propylene, 47,000 tpa of butadiene and some other streams. The feedstock naphtha, will be available from the Hindustan Petroleum Refinery at Vizag. Shortfall, if any, will be met through other sources, including imports.

The complex is also expected to include downstream units like PVC, LDPE, HDPE, Polypropylene, styrene and polystyrene. The project will be executed by the newly formed UB Petrochemicals Limited. Incidentally, this is one project which has interested the Andhra Pradesh Industrial Development Corporation (APIDC) which had filed an application in 1986. It even assigned Engineers India Limited (EIL) for preparing a feasibility study, at its own cost. The report was submitted to the Central government.

Recently, Mr. M.S. Gill, Secretary, Department of Chemicals and Petrochemicals had visited Andhra Pradesh to assess the infrastructure facilities likely to be available for the project. This includes a proper site and adequate land availability, power and water supply to the complex and the feedstock availability.

US GRANT FOR AGRICULTURAL INDUSTRIES

Indian Institute of Chemical Technology and Osmania University, Hyderabad, and Regional Research Laboratory (CSIR), Jorhat, Assam, have been awarded agricultural research grants, totalling Rs. 51.54 lakh, by the US Department of Agriculture.

The grants are for research on inhibitors of insect growth and reproduction derived from natural products, effect of agrochemicals on soil microflora, and gene manipulation in rice through plant tissue and cell culture. I. Kumuda Sukumar, J. Venkateswara Rao, Balaani Bezbaruah and G. Reddy are the Indian scientists who will go ahead with the investigations in the respective subjects.

ONGC replacing diesel engines with CNG

The Oil and Natural Gas Commission (ONGC) has set up a task force to work on a 100% spark ignition system that will help to completely replace the use of diesel in transport vehicles with compressed natural gas (CNG). ONGC sources said the task force included representatives from the automobile manufacturing units, the engineering industry and State transport authorities.

This follows the initial success achieved by ONGC in converting petroleum vehicles and also passenger buses of the Gujarat Road Transport Corporation to run on diesel along with CNG. Successful trial runs had been conducted on stationary diesel engines used at drill sites, they said. The task force will also assess the experience gathered in this area by other countries, they said.

According to the sources, the use of CNG as a vehicular fuel had been gaining importance in other industries. In India, there are about three lakh vehicles presently running on CNG. It has been introduced as an alternate fuel in New Zealand during the last decade. And over 1.5 lakh vehicles had been converted. New Zealand also has a wide network for CNG distribution.

The US and Canada have been using CNG for a decade now, with nearly 5,000 vehicles consuming this fuel, the sources said. Many developing countries are seeking expertise in this area to reduce the burden on liquid hydrocarbons. In India, where the transport sector accounts for 56% of the total consumption of oil, a Rs. 28 lakh project has been entrusted to ONGC for the use of CNG in transport vehicles. Apart from the reduced dependence on oil, CNG offers other advantages like lower fuel cost per kilometre. It is estimated that CNG would save about Rs. 50 for every 100 km. for a diesel driven truck. The conversion of petrol engines would prove to be even more attractive. According to the sources, CNG has

other merits like lower maintenance costs and less pollution. It is also safer to handle, they added.

LEATHER FAIRS AT SEOUL, TOKYO IN NOVEMBER

The Council for Leather Exports is organising special buyer-seller meets at Seoul and Tokyo in November next to capitalise on the interest shown by genuine importers in Indian leather shoes. This decision was taken following a high level delegation's recent visit to South Korea, Japan and Australia to explore possibilities of joint ventures in this field. According to the Chairman of the Madras based council, Mr. M.M. Hashim, Seoul has shown considerable interest in Indian shoe uppers and shoes following a 15 per cent reduction in import duty on shoes by the South Korean Government. Another advantage for the Indian merchandise was that their cost of production has been on the rise.

Therefore, the council feels that there are distinct possibilities for setting up of joint ventures in South Korea for sports shoes and leather garments. All the three countries have also shown, during the exploratory visit keen interest in 'Horachi' (hand-made Indian footwear). The emphasis was on more fashionable designs rather than the typical traditional ones.

However, current quota restrictions on import of shoes by Japan and high degree of protection to local industry in Australia have placed India in a disadvantageous position. But Mr. Hashim feels that these restrictions are going to be relaxed in a couple of years and the Indian Exporters should keep themselves ready to enter the market as soon as the rules are relaxed.

There is no restriction on import of shoe uppers by Japan and the Indian exports are growing steadily. So is the case with Australia in this field. The

council has mooted a proposal for getting 'Horachis' exempted from the purview of quota restriction and liberalised import duty. Efforts are also underway to get the import duty on shoe uppers reduced in Japan. In Australia, the council proposes to organise buyer-seller meets in Sydney and Melbourne with the active cooperation of international trade development centre on a self financing basis in February last year. The council has suggested to the textile footwear and clothing authority of Australia to consider exempting from import duty such shoe uppers and shoes as may be exported from India but made with Australian raw material. Doubtless, these are potentially important markets and we have to keep up our efforts in those countries, the chairman said.

LEVY ON RECTIFIED SPIRIT STAYED

Mr Justice K. Shivashankar Bhat in the Karnataka High Court recently ordered issue of notices to the State Government and excise authorities in a writ petition filed by V.S.G. Chemical Industries, a firm manufacturing ethyl acetate of Koppal taluk in Raichur district challenging the levy and collection of "privilege fee" on rectified spirit used for industrial and chemical purpose. The petitioner had submitted that it had valid licences for the manufacture of ethyl acetate using the rectified spirit allotted by the State Government under the excise rules.

The Petitioner further submitted that the rectified spirit was unfit for human consumption. The petitioner contended that as per provisions of the Karnataka Excise (Excise Duties) Amendment Rules and the Karnataka Excise (Rectified Spirits) Amendment Rules, the State Govt. by notification had levied an excise duty of Rs. 2/lit and in addition to the same, a further amount of litre fee had been levied. The petitioner contended that the levy was illegal and without the authority law. Justice Bhat by an interim order stayed the levy.

Four gas-based units coming up in Tripura

Four new gas-based industries in the joint sector area in the pipeline for Tripura. Official sources said the number of industries in the State is expected to go up considerably with the improvement of availability of infrastructural facilities in this chronically backward State. The National Thermal Power Corporation (NTPC) is apparently satisfied with the infrastructural facilities for the setting up of a 500-mw gas-based super thermal project.

They said the infrastructural bottleneck had once stood in the way of setting up of industries but now with the identification of huge natural gas deposits and steady development of infrastructural facilities the State is on the threshold of rapid industrialisation. The State's present dependence on other North-Eastern States for power would be over by the end of the current financial year. Another 75-mw project, with the financial help of the North-Eastern

Council, is also on the anvil.

The Tripura Industrial Development Corporation (TIDC) is striving hard to improve the State's industrial scenario. While the memorandum of understanding has already been signed for a vanaspati plant, a most modern methanol plant has also been finalised.

The Rashtriya Chemicals and Fertilisers (RCF) has agreed to take up the massive 300-tonne per day capacity methanol plant at a cost of nearly Rs. 120 crores. ONGC, TIDC and the Indo-Burma Petroleum Company would also be involved in the venture. The unit is expected to help generate a series of down-stream industries.

Promotion of the Tripura Petrochemicals in collaboration with either of the two public sector undertakings — Assam Gas or Bombay Gas — is also on the cards to regulate and control the

natural gas supplies to all its users. This would ensure smooth handling on the work and remove wastage of available natural resources. Another gas-based project to produce bricks mechanically is also expected to take shape shortly. Meanwhile, TIDC is trying to improve upon ONGC to maintain their supply to the power units at the rate agreed earlier. The concessional rates, the sources said, would be very crucial for the new ventures and for rapid industrialisation of the State.

SIMPLIFICATION OF EXPORT DOCUMENTS UNDER STUDY

The Govt. is considering proposals for simplification of export documents to cut short procedural delays, according to the Chief Controller of Imports and Exports, Mr. Tajendra Khan. Indicating this at a meeting organised by PHD Chamber of Commerce and Industry recently, he said a final decision in this regard would be taken soon.

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OIL RELATED EQUIPMENT

Panel to study tax benefits

The Union Government has constituted a high-level committee to hammer out a scheme which will taper down the tax concessions available to the domestic oil related equipment and chemical industries and services, without adversely affecting the pace of indigenisation in these sectors.

According to official sources, the committee, which has representatives from the Finance Ministry, Petroleum and Natural Gas Ministry, Oil Industry Development Board and the Oil and Natural Gas Commission, will work out the scheme in consultation with the representative bodies of oil related equipment and chemical manufacturers.

At present, in all purchases, price preference is given to indigenous units which goes as high as 40 per cent in the case of services. In fact, supplies to oil industry are being treated as deemed exports. Components and spares required for manufacture of goods to the oil sector either do not attract custom duty or are subject to levy of highly concessional duties.

According to official estimates, the Government directly or indirectly has been giving almost Rs. 250 crores annually in the form of incentives to the indigenous units. It was in 1982 that the Government announced special incentives and deemed export benefits for supplies to oil sector as a part of its strategy for development of domestic industry.

The committee has been set up at the instance of the Finance Ministry. The ministry is believed to have decided to curtail the incentives available to the oil related industry for two reasons — to garner more revenue and help the domestic industry become competitive.

Official circles feel that the indigenous industry has been able to stand on

its feet by now, thanks to the incentives and benefits made available to it. However, any further continuation of this scheme will only result in making it flabby and uncompetitive in the global market and unnecessary revenue loss to the Government.

The country produces sophisticated equipment and machinery for the oil sector such as jack-up rigs, drill ships, well-heads and christmas trees. A large number of joint ventures have also been approved by the Government in wide ranging areas of oil exploration, drilling, production and services including oil-field chemicals. The worth of chemicals procured for oil industry is put at Rs. 60 crores — fulfilling nearly 60 per cent of the annual requirement.

While the indigenous purchases for equipment, materials and services for ONGC and OIL together during the

Sixth Plan accounted for about 44 per cent of total purchases, the figure is likely to move up to 56 per cent by the end of the current year. The present target of indigenisation of oil related industries and services for the Eighth Plan is put at 65 per cent. Cumulative achievement of indigenisation in terms of orders placed on domestic firms has been estimated at Rs. 3,700 crores in 1982.

MANGALORE REFINERY PROJECT

The Mangalore Refinery and Petrochemicals complex is likely to go on stream by July 1993. Talking to newsmen at Hubli recently Mr. P. Ramakrishna, Director (Marketing), Hindustan Petroleum Corporation said a detailed project report had been submitted to the Union Government and its approval was being awaited. The project would cost about Rs. 1,540 crores with a capacity of 3 million tonnes. It will also have a naphtha cracker unit.

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EPS strategy boosts ONGC production

The Oil and Natural Gas Commission (ONGC) claims to have produced 1.09 million tonnes of additional oil worth about Rs. 170 crores in a year by putting 33 of its discoveries on early production system (EPS). The EPS strategy, according to official sources, is used to expedite the development of a field by putting a hydrocarbon strike on production quickly without waiting for the complete infrastructural facilities. It enables the assessment of the well and reservoirs potential, before complete delineation of the prospects, as well as an early return on investment.

The early production systems onland are formulated by putting up well-head installations based on the test results of a single well on one or more wells in the area. The oil is stored usually in an overhead storage tank and transported to the nearest installation by road tankers. In offshore, the oil produced is sent to the production facility and is then transported through tankers via a single buoy mooring system (SBM).

The first EPS was installed at the Lahor structure in Cambay Basin in November, 1984. Since then this strategy has been utilised to put 32 more structures on EPS in onshore as well as offshore. Many of the discoveries made during the Sixth Plan have already been put on production through EPS in the Seventh Plan. Some of these include Gandhar in Gujarat, Narimanam, Kaikalur (Krishna-Godavari Basin in Andhra Pradesh, Bhuvanagiri (Cauvery Basin) and D-18 and Panna in the West Coast.

The Gandhar discovery was made in November, 1983 and the well was put on production in May, 1986. The initial rate of production which was about 10 tonnes per day has now been increased to about 1700 tonnes per day. In the Cauvery Basin, the Narimanam discovery was made in July, 1985 and the production commenced within eight months of this discovery. The Bhuvan-

agiri discovery was put on production in even shorter time. The discovery was made in October, 1987 and was put on production within two months from the date of find.

In fact, in the southern region the entire production is being sustained through EPS. The total rate of production is about 300 tonnes per day from the EPS at Narimanam, Bhuvanagiri and Kaikalur in the Cauvery and Krishna-Godavari Basins. A recent find at Nada in the Cambay Basin in Gujarat has proved to be a bonanza for ONGC. The well flowed at the rate of 300 tonnes per day (2000 barrels per day). This well was put under production in just seven days. This single well is equal to over 20 wells onland.

A maximum number of 20 EPS have been commissioned in the western region in Gujarat. In the eastern region in Assam, EPS have been successfully used in three fields—Changmaigaon, Demulgaon and Namti. In Tripura, two gas producing structures - Rokhia and Agartala dome have been connected through EPS for supply of gas to various consumers.

In offshore, the first EPS named Sagar Laxmi was commissioned in December, 1986 in the Panna field. The oil produced from the field is processed at this jack-up based production facility and is transported to a tanker through a single buoy mooring system (SBM). The second structure offshore - D-18 was also put in production recently. The structure was discovered in 1985 which showed a prolific rate of production (3000 barrels per day). In order to expedite the development of this field the floating EPS has been deployed.

This involves semi-submersible based production facility which is connected to a SBM. Two satellite wells completed sub-sea have been connected to this production facility. The design capacity has been made for processing

2000 barrels of crude per day.

SUBSIDY FOR SMALL UNITS

The Tamilnadu Government recently announced a capital investment subsidy of 15%, subject to a maximum of Rs. 15 lakhs a unit, for small scale industries set up in backward taluks. The subsidy will also be available to the existing units which take up substantial expansion or diversification subject to certain conditions. The Govt. also announced a Special State Capital Investment subsidy of 20% upto a ceiling of Rs. 20 lakhs for the leather industry.

Electronics industry, auto ancillaries, drugs and pharmaceuticals, food processing industries, solar energy equipment, gold and diamond jewellery exclusively for export, jute processing industry in six select taluks, pollution control equipment, sports goods and accessories, cost-effective building materials such as aluminium, PVC doors and windows and windowframes will be eligible for the special subsidy of 20% subject to a maximum of Rs. 15 lakhs. The incentive will also be available for the existing small scale industrial units undertaking substantial expansion or diversification. As part of a package of incentives, the Government has decided that all new small scale industries be eligible for deferment of payment of sales tax for five years.

The total benefit will be the actual sales tax payable for five years or Rs. 10 lakhs for five years together or 80 percent of the capital invested for the units located at State Industries Promotion Corporation complex and growth centres or 70% of the capital invested in respect of the units located at other places. The units in towns with more than 3 lakh population (as per the 1981 census) and the city of Madras with 15-km belt area, and the Tiruchi, Coimbatore, Madurai and Salem urban agglomerations with an 8-km belt area will not be eligible for the liberalised interest deferral scheme.

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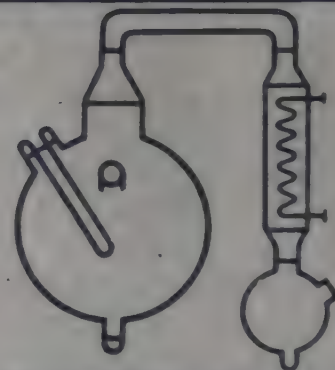
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Highlights in Chemical Technology (Part 1)

NEW PROCESS GETS THE KEY OUT OF RECYCLED PAPER

A new process developed by Henry Boucher/Pates Papiers et Toxilos (France) will make recycling of old newspaper commercially viable and profitable. In order to fully realize the economic and ecological benefits of recycling old newspaper, this new French process restores heavily inked cellulose fibres of newspapers to their original whiteness.

On line for several months, the new Boucher method involves three processing phases. The first defibering of the trap paper and addition of ink removal and bleaching agent requires a special pulper designed to disperse the fibers without damaging them or separating contaminants too much. The next stage purifying the fibres, is dependent on which contaminants are present and whether or not they are heavier than the pulp, and finally the removal of the ink, which is described as 'the truly innovative stage in the process'.

This third stage sends the pulp through two consecutive ink removal chambers. When the pulp and soap-used ink removal agents are put through these large vats, the ink and certain other impurities float on top of the foam that forms on the surface. Suction devices draw the foam off and the pulp thickened to a consistency of 15% and silverised when exposed to heat. Post bleaching products may also be added to give the pulp more bulk and a smoother texture. The highly concentrated solution is then stored to await transfer to the paper machines.

The Company expresses confidence that the current quality can be maintained at a lower cost operation in the fibre-

treatment area, using lower quality raw materials. The Company's Managing Director Henry Bowcher says the price of raw materials in the paper industry is on a steadily upward path and increases, for instance, for virgin market pulp, cannot be recovered in the selling price of the paper. This he explains is where the new de-inking capability will have a beneficial effect on operating costs. (CMR, 4/24/89, p.31)

POLYMERS RECYCLE PROCESS (POLYSOURCE) DEBUTS IN USA FROM JOINT VENTURE

A new post consumer waste plastics recovery process will be commercialised in USA by Polymer Resource Group, a Baltimore, Md. based US/West German joint venture company. Called the 'Polysource' system, it will be put into operation across the USA through a series of facilities to be built over the next two years, according to Peter F. Osterchrist, chairman of ITC Inc. of Baltimore, the American partner in the new enterprises. The first plant will be in operation by March 1989 in Baltimore/Washington area. The new system was described at a plastics waste recycling conference in Washington in a paper presented by Andreas Stolzenberg of AKW Apparate and Verfahren GmbH, the venture's West German partner.

'Polysource is the only post consumer plastics recovery system in the world that is proving itself in actual commercial operation' reports Stolzenberg. The German AKW is now producing and marketing high purity raw materials suitable for reprocessing and is fully confident about the commercial scale workability of the new system. The key to the AKW plastic recycle system are the 'efficient and compact AKW hydrocyclones'. The process also uses the

AKW front and sortation system, which accepts used consumer plastics waste and separates it according to specific type for subsequent processing.

Unlike other systems the 'Polysource' process is entirely mechanical throughout and utilizes no solvents. The American partner ITC provides minerals and raw materials for the chemical and paper industries and markets throughout Europe, South America and South East Asia. The German AKW is a subsidiary of Amberger Kaolinwerke GmbH of Hirchan, West Germany and manufactures technical processing systems. (CMR, 5/29/89, p. 5).

THE ASME BOILER AND PRESSURE VESSEL CODE BECOMES ELECTRONIC

The ASME Boiler and Pressure Vessel Code is a legal standard in USA and is used around the world. It is normally revised every three years; during the intervening years, addendum editions come out. Subscribers pay \$ 3,400 for a three-year subscription. The code will now appear in a compact-disc (CD-ROM) version in 1989 as a result of a joint development between the American Society of Mechanical Engineers & Information Handling Systems (Englewood, Colo, USA).

The CD-ROM version will cost up to \$ 5,500 per year and will be updated with a new disc annually. With about \$ 7,000 worth of additional hardware and software, an engineer with an AT-style personal computer will be able to quickly access any word, drawing, table or footnote. In conventional (book) form this year's Code runs over 11000 pages in 24 volumes. The printed code will be complemented with a single CD-ROM disc and 'front-end' software developed by Information Handling Systems (IHS) to form rapid searches through the text.

based on keyboards or cross references. IHS claims that the software will cut the energy search time by a factor of 20 or more. (*Chem Eng.*, 5/1989, p. 19)

QUEEN'S AWARDS IN BRITAIN FOR CHEMICAL & ALLIED FIELDS FOR 1988

Her Majesty the Queen in Britain has made the following 5 awards for Chemical technology achievements:

(a) Cambridge Research Biochemicals jointly with Medical Research Council for an improved solid phase process for peptide synthesis.

(b) Edwards High Vacuum for the Drystar design of high vacuum equipment which takes advantage of the Roots flower and Northey claw type mechanisms.

(c) Oxford Instruments for development of a 14.1 tests superconducting magnet for nuclear magnetic resonance (NMR), spectroscopy at 600 MHz.

(d) Domnick Homter Filters for Pucudri, a compressed air dryer of non-welded construction using common parts bolted together for various capacity needs. Parallel chambers are alternatively used.

(e) Courtaulds for Sorbsan surgical dressing that forms an absorbent gel on a wound. (*Mfg. Chemist*, 5/1989, p.9).

A NEW SYNTHETIC LUBRICANT WITH LONGER LIFE

Ingersoll-Rand's new synthetic lubricant is claimed to have a service life of up to ten times that of conventional petroleum-based oils. Called XL-700 it is designed to minimize carbon build-up in the Company's range of large reciprocating air compressors.

Formulated with anti-wear additives the product is said to protect compressors while operating under heavy load condition. It features good lubrication, thermal stability and stable viscosity. It also provides good solvency which

assures clean systems thus reducing maintenance costs. It remains liquid at colder temperatures than competitive products, reports the company. (*Mfg. Chemist*, 5/1989 p.21).

NATURAL POLYMER CHITOSAN BECOMES A COSMETIC INGREDIENT FOR HAIR CARE PRODUCTS

Chitosan, a natural polymer extracted from shells of crustaceans is now being marketed by Allied Colloids for use in the manufacture of hair-care products. Chitosan after cellulose, is the most plentiful natural polymer. It has many of the properties of synthetic cationics like good hold and conditioning but has the added advantage of being biodegradable and non-toxic. It comes as low-density flakes, soluble in dilute mineral acids and organic acid solutions or in powder form as the water soluble adipate salt.

For further details, write to: Alfred Colloids, P.O. Box 38, Low Moor, Bradford, Yorks, UK. (*Mfg. Chemist*, 5/1989, p.23).

A NEW ELECTROCHEMICAL PROCESS FOR DESTROYING ORGANIC HAZARDOUS WASTE ON THE HORIZON

The British Atomic Energy Authorities (AEA) technology division has developed a new process for destroying organic hazardous wastes. The new process is expected to be commercialised in two to five months. At the heart of the process is a silver salt/nitric acid membrane electrochemical cell. This produces highly oxidising silver II at the anode which generates free radicals on reaction with oxygen from water molecules in the electrolyte. The free radicals attack organic molecules, ultimately converting hydrocarbons to carbon dioxide to form nitrous acid.

According to the AEA technology development scientist, Dr. David Steele

(the inventor of the process), the mode of reaction means that the hydrocarbon wastes can be destroyed without generating environmentally detrimental by-products that require special handling. Also, silver is regenerated and nitrous acid can be recycled relatively easily to nitric acid.

Inorganic components can be handled by the method. Chlorine contained in polychlorinated biphenyls (PCBs) for example, is emitted as gas and can be removed by passing through caustic soda. In addition, Dr. Steele reports solids do not present a problem although they have to be granulated and requires handling equipment.

Dr. Steele notes that electrochemical process is particularly suited to destroying troublesome wastes which are currently incinerated. Wastes such as PCB which are low in flammability require more fuel to burn efficiently. However, Dr. Steele says these substances require less energy for destruction in the electrochemical process. In addition, the process is claimed to be safer and cleaner than high temperature incineration as it is operated at low temperature and pressure and can be turned off.

Having already demonstrated the process on laboratory cells, the AEA project is currently working on pilot plant equipment and looking at commercial cells. The development arose from work being done on AEA nuclear reprocessing division, so it is possible that the organisation will jointly innovate the technology with partner more in touch with organic waste processing.

Now, since the know-how has been demonstrated the organisation is keen to commercialize the technology. Options include licensing out the technology or building and operating units itself. Estimates of coating suggest the units could compete with high-temperature incineration to treat difficult wastes. While they are likely to cost more to build

operation should be cheaper. The AEA has already applied for patents on the technology. (*ECN*, 6/12/89, p. 11).

A NEW MELT EXTRACTED HIGH CHROME STAINLESS STEEL FIBRE IMPROVES REFRACTORY PERFORMANCE

A melt extracted high chrome stainless steel fibre (called ME 446) from Fibre Technology UK is capable of improving refractory performance by offering high levels of strength and high temperature resistance. The new fibre claims to benefit a wide range of industries by substantially reducing maintenance materials and energy costs.

High temperature processing industries have found that refractory maintenance can be kept to a minimum by the use of melt-extracted (ME) fibres. Used in most types of conventional, low-cement and ultra low-cement castables, the fibres are readily dispersed easily mixed by casting, and capable of being gunned using standard equipment. In addition to these benefits, the ME 446 is able to withstand attack at high temperatures and is generally resistant to certain combustion atmospheres particularly those found within furnaces.

Because ME 446 contains unusually high levels of chrome and does not contain nickel (which recently experienced a massive price increase), the fibre exhibits superior performance characteristics and is competitively priced. The new stainless steel fibre has already found applications, in reinforcing refractories in iron and steel, cement and rock products, foundry, power generation and many other industries worldwide. In iron and steel, for example, ME 446 has proved an ideal component in coke oven doors and ascension pipes, blast furnace applications, furnace doors, injection lances, turndish linings, well block and degasser vessel legs.

In cement and rock products industry, applications within rotary kilns for ME 446 fibre include preheaters, chain

sections, nose rings, lifters and satellite coolers. (*Refractories*, J. March/April '89, p. 13).

WORLD'S FIRST WATER-BASED GENERAL PURPOSE ADHESIVE FOR RUBBER TO METAL BONDING

What is reported to be the world's first water based general purpose adhesive system for rubber-to-metal bonding has been recently introduced in Britain by Lord Corporation. The general purpose Chemlok 802/828 bonds various elastomers including natural rubber, SBR, polyisoprene, neoprene and other primed metal and other rigid substrates during the vulcanisation process.

The cover coat adhesive 828 is about 40% solids and is put on by conventional techniques as received or diluted with water. Although the 828 adhesive is designed for 802 water based primer, both are compatible with solvent-based adhesive systems. (*Mfg. Chemist*, 6/1989, p. 21)

VIVRELLE — A NEW COMFORTABLE SYNTHETIC FROM SNIA FIBRE (ITALY)

Vivrelle from Snia Fibre Italy, a new synthetic fibre for use in apparel provides a high degree of comfort. Vivrelle is comfortable to wear because it is hydrophilic and hygroscopic and gives a high degree of absorption and transfer of body moisture and intrinsic softness gives a pleasing handle. The high level of moisture absorption and transport decreases the humidity level of the microclimate between the skin and the garment, and the fibre is said to be particularly useful for active garments for strenuous physical activities.

Research and development of Vivrelle was carried out by Snia Fibres in conjunction with Sun Refining & Marketing, of Philadelphia. This brought a new copolymer which gave rise to a new family of fibres with generic name

of polyoxyamides, which includes Vivrelle. The new fibre is already in use in woven fabrics and garments, as well as knitted underwear and sportswear and tests are underway in the nonwovens area, particularly for medical and industrial end-uses. Best results are claimed when Vivrelle is used in blends varying from 20-50% with wool, angora, cashmere, alpaca, viscose staple or synthetic fibres.

The fibre is produced in deniers and lengths suitable for the wool and cotton systems sectors. The strength and elasticity of Vivrelle makes it easy to process on weaving, fully fashioned or circular knitting machines and fabrics can be processed on the same equipment as used for wool or cotton fabrics, including bulking. For further information contact Snia Fibres, Cosano Maderno Milan, Italy or Snia (UK) Ltd., 36, Broadway, St. James, London, UK.

ON-SITE CHEAP ECONOMICAL CHLORINE UNIT MAKES A DEBUT IN JAPAN

A compact on-site chlorine manufacturing system has been developed by Japan's Electrolysis Process Laboratory of the Government Industrial Research Institute. The system uses the solid polymer electrolyte hydrochloric acid electrolysis process -- hydrochloric acid is electrolysed from high concentration to low concentration at room temperature -- and also suppresses the generation of waste hydrochloric acid to less than 5%.

A comparison of this on-site system with the performance of conventional industrial electrolysis, shows that conventional system are characterized by a chlorine concentration of about 20% and an electrolysis temperature of 80°C, whereas the on-site system features capability of changing the chlorine concentration at room temp. from 20% to 5%. In addition, the new system required only about 2/3rds the electricity and the cell voltage for producing 1 kg. of chlorine. (*Mfg. Chemist*, 5/1989, p. 7).

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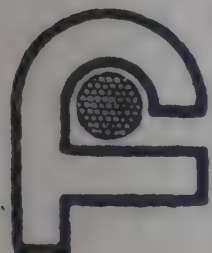
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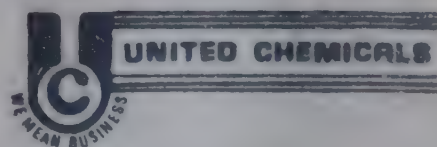
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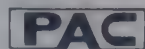
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Oleochemicals as plastic additives *

By P.D. Kamat (Fine Organics) & J.R. Shah (Jayvee Organics and Polymers Pvt. Ltd.)

Introduction

Since World War II the development and growth of plastics has been phenomenal. The technology for the manufacture of polymers and plastic products has expanded into the most important of the chemical-based industries, producing new products for new uses at a remarkably high rate. This has led to the development of not only polymers and copolymers but also blends and alloys of various combination structures, especially developed to meet specific requirements.

Success of this development depends entirely on Speciality Plastic Additives. Additives permit the use of plastic in applications where the plastic materials as such would have had a small chance of success. Additives are accepted today not only as full-fledged partners of plastics but have become an integral part of the whole polymer manufacturing and processing industry. It is hoped in this way to stimulate further, in depth collaboration among plastic producers, plastic processors and additive manufacturers. This in turn should lead to long term meaningful development; thereby further strengthening the position of plastics as, materials of the future.

The term "Plastic Additives" generally includes various types of products: Pure compounds or formulated products used in plastic resin manufacturing or processing or finishing operations. These additives are lubricants, stabilisers, plasticizers, fillers, flame retardants, bonding agents, chellators, antifog agents, reinforcements, colourants, coupling agents, antioxidants, metal deactivators, mould release aids, viscosity controllers, dispersing agents, cell controllers, crosslinking agents, blowing agents, nucleating agents, light stabilizers, antistats, activators, gloss/transparency improvers, extenders and solubilizers.

Oleochemicals as plastic additives

The source of oleochemistry is nature's renewable supply of biodegradable and non-polluting raw materials i.e. natural fats and oils. These desirable properties are carried over to the basic oleochemicals. All or most of them, depending on the molecules with which the fatty acids are combined remain present in these oleochemical derivatives. The harmlessness and generally non-toxicity characteristics of oleochemicals makes them extremely well suited for every step of the manufacture of plastics that are intended to come into contact with foodstuffs.

Oleochemicals serve different purposes

The long hydrocarbon chains of fatty acids makes them

efficient reducers of external friction.

2. Polar characteristics make several oleochemicals compatible with the halogen containing polymers and function as internal lubricants and plasticizers.
3. Some oleochemicals were developed as lubricants with synergistic activity in given stabilizer system.
4. Surface-active properties of oleochemicals are responsible for their use as polymerization emulsifiers.
5. Several oleochemicals are primary or secondary plasticizers, depending on the polymer systems in which they are used.
6. Some oleochemicals are antistatic and antilogging aids for specific systems.

The broad category of these oleochemicals are fatty acids, organic esters of fatty acids, metallic salts of fatty acids, fatty alcohols, esters of fatty alcohol, glycerol/glycol and sorbitan esters, pentaerythritol esters, fatty amines and amides etc.

The applications of oleochemicals as additives in plastics are so varied and numerous that we can only discuss briefly some of the main aspects of their use in Plastics Speciality Additives. Oleochemicals have wide applications in Plastic Industry as speciality performance additives are External lubricants, internal lubricants, combination lubricants, antiblocking agents, slip agents, mould release agents, antistatic agents, antifogging agents, cling agents, transparency aid/gloss improvers, pigment dispersing agents, wetting agents, speciality plasticizers, epoxy plasticizers, viscosity depressants/controllers, anticracking and stress resistance aid.

Lubricants

First let us analyse why lubricants are needed; Why are lubricants needed?

1. To reduce intra molecular friction.
2. To impart external lubricity for processing.
3. To reduce load on the processing equipment.
4. To modify Rheological properties of polymers and to change its flow characteristics.
5. To ensure that the processed article has minimum defects and mould cavity filled properly thereby reducing the rejects.
6. To aid homogenisation of polymer melts alongwith other ingredients present in the systems.
7. To permit processing at lower temperatures and at increased speeds and reduce thermal degradation of polymers.
8. To save energy and increase production.

In other words therefore, the performance criteria for lubricants are clear. They must facilitate the processing in such a way that production runs economically and without inter-

ruption, leading to final articles technically and aesthetically acceptable. Lubricants are characterised as being external or internal.

Internal lubricants

Oleochemicals having low molecular weight and polar groups generally perform as internal lubricants. At melt temperature they disrupt intermolecular attractions, serving to promote flow and to reduce apparent melt viscosity. The use of internal lubricants often permit processing at lower temperature and increased moulding speeds. In addition to potential energy savings, improvement in product properties can be realised due to reduced polymer degradation.

Among the physical properties that can be enhanced are heat stability, impact strength, colour and clarity. Improved flow promotes mould filling, resulting in better dimensional control and surface quality. Excessive levels of internal lubricants may lead to a decrease in heat deflection temperature and lower impact strength. Plateout can result if excess lubricant is used.

External lubricants

External lubricants are usually non-polar and have generally higher molecular weights. Their lack of affinity for the polymer reduces their internal functionality. Oleochemicals having these characteristics in a given polymer system function as external lubricants. They cause delay in fusion, allowing the polymer belt to slide over metal surfaces. They provide slips, antiblocking, and mould release. The predominant influence on the product is to improve surface finish and gloss and to get higher production out-puts.

Combination Lubricants

Some oleochemicals also have unique properties of functioning in dual role, having both internal and external lubricating effects which may change depending on their parameters such as speed, temperature, pressure, concentration and polymer systems they are used in. As concentration is increased, the internal lubricants exceeds solubility in the polymer and becomes more external in its action: Increase in temperature causes external lubricants to become more soluble in the resin and decrease their external functionality.

selection of a lubricant

The exercise of selection is a combination of art and science and many times depends on the type of the processing equipment, nature of the end-product and more often depends upon personal experience of a technologist. A constant dialogue between a processor, resin producer and lubricant supplier can give the desired results. The problems arise due to excessive lubrication like surface waviness, uneven flow, exudation and plateout on the surface and this creates tremendous problem in printing, hot stamping and other post processing operations.

Though lubricants directly and indirectly offer several advantages, great care is necessary in exercising the choice. The characteristics of an ideal lubricant in system can be summarised as under:

1. Lubricant should penetrate and disperse homogeneously in the system;
2. Must have selective compatibility;
3. Should not excessively exude;
4. Must not hamper performance of other additives.
5. Must not degrade under heat and pressure or under severe processing conditions;
6. Should not impart any colour or odour to the polymer
7. It should interfere the least with post moulding or finishing operations, and above all;
8. It should be economical.

Mould release agents

Oleochemicals are employed as internal mould release agents in moulding of different plastics. These substances are applied to the surface of a mould to provide release coating on the cavity. This prevents the moulded articles from sticking to the mould and facilitating its easy removal without damage. Most commonly used external mould release agents are silicones. These are generally applied by spraying. This no doubt gives an easy release but besides being labour intensive often creates other problems like patches and interference in post moulding operations.

Therefore now more popular is the use of oleochemicals as internal mould release agents which are incorporated at the compounding stage and thereby eliminating labour intensive operations and related problems. Use of mould release agents ensures faster moulding cycles. Time spent on cleaning moulds is reduced and use of release sprays between cycles are greatly reduced and in some cases sprays are totally eliminated, thereby facilitating total automation of production parameters.

There is hardly any polymer, whether thermoplastic or thermosetting, which functions without mould release agent and hence safest course is to select an appropriate oleochemical derivative to achieve the desired results. Internal mould release agents are incorporated into the polymer. They slowly migrate to the surface and form a thin and highly effective release film which prevents the article from sticking to the mould and it causes the moulded article to fall out unaided.

These mould release agents improve the flow of the resin into remote or inaccessible mould area and this improved flow may be a necessary supplement to resins which are normally considered to be self lubricating. More complete filling of the entire cavity will reduce scrap. Cleaner moulds and cavities and reduced maintenance will also be an added advantage. Mould cycle time is reduced and production efficiency is achieved through reduced pressure and power requirements.

agents. Many oleochemicals when used in large injection mouldings or rotational mouldings as mould release agents not only improve flow during the processing but also greatly enhance surface gloss and environmental stress and crack resistance.

Oleochemicals in engineering plastics

Many engineering plastics are difficult to process, particularly when they are heavily filled with mineral fillers and glass fibres. Such polymers sometimes produce more abrasion on equipment surface. It is therefore necessary that proper slip is created during their processing. Producing slip in engineering plastics presents problems not ordinarily found when working with commodity plastics.

The most common problem found is finding slip agent that will produce the desired effect and withstand the high temperature. Oleochemicals derivatives are available to any such type of engineering plastics. The processing conditions required to produce outstanding engineering plastics are just too intense for most of the common lubricants. Hence, specific additives are required which will not decompose during high temperature processing.

Pigment dispersing agents and wetting agents

Many oleochemicals are excellent wetting agents and pigment dispersing agents. In addition, they impart good gloss and good lustre. They are commonly used in masterbatches or colour concentrates/compounds. Proper selection of a wetting agent as a dispersing agent also helps to reduce pigment consumption without affecting the colour intensity. They are a great aid especially when high concentration of carbon black pigments are used.

In hot condition, the pigment dispersant generates a honeycomb structure having countless micro-cavities and colour in fine form occupies these cavities. At an elevated temperature and under shear, these micro cavities collide with each other and on getting momentum, colour starts dispersing uniformly in the resin. It is not out of place here, to mention that in masterbatches where concentration of metallic pigments like chromium, lead and iron compound, compounds like titanium dioxide is very high and they have tremendous metal wearing properties.

Instances have been reported that these compounds sometimes wear barrel and screw of extruder, much more than filler like calcium carbonate. Hence, the selection of pigment dispersing agents with lubricating effects ensures not only homogenous and uniform dispersion but also protects the processing equipment by reducing the friction caused due to the presence of metallic pigmenting compounds.

Antistatic agents

Plastics by and large being electrical insulants their pro-

cessing and uses usually associated with the generation of static electricity. This static charge on surface creates several undesirable side effects like:

1. Accumulation of dust.
2. Problems in subsequent processing like wrapping and covering in packaging machines.
3. Fire hazard.
4. Interference with finishing, printing, decoration etc.

And in some cases; it is therefore necessary that problems associated with static charge are minimised and if possible be eliminated. This can be done effectively by oleochemicals, which are used as antistats in various polymer systems. The surface charge may be reduced by externally spraying with a dilute solution of an antistat or internally by adding the antistat to the polymer.

However, use of internal antistats is preferred because of its lasting effect and addition of antistat is more useful in special fire hoses, coal conveyors, packaging, films for wrapping on fast cycle machines, crates, frequently handled entertainment gadgets, instrument housings, suitcases, household articles, floor coverings, leather cloth etc. Use of antistat is growing more important in products used in building industry.

Anticracking or anti-splitting agents

Some polymers especially olefins have a tendency to split or to crack when subjected to the action of polar organic liquids or due to environmental stress. This tendency, if not controlled, can cause severe damage. Some oleochemicals based internal mould release agents, if incorporated properly may provide this additional resistance and anticracking and antisplitting to the moulded article. The problems of stress cracking is more pronounced in blow moulded articles required for packaging of liquid industrial products containing highly polar chemicals like methanol, ethanol, acetone, acetic acid, ethyl acetate etc.

It has been reported that when telephone cables insulated with polyethylene are treated with polar organic additive to facilitate slipping the insulated cable through conduits, splitting occurs due to biaxial stress when such cables are bent. These additional antistress and anticracking oleochemicals may be of an advantage.

Antiblocking agents

It has been a common experience that several polymer films when come together adhere each other creating problems at the use stage. This phenomenon of blocking is mainly due to static charge developing on the film's surface. Further during extrusion of LDPE or PVC blown tubular films, blocking occurs at the nip rolls, retaining the inflating gas within the tube, particularly during extruding at high rates. The temperature of the tubular film entering to the

nip rolls is frequently high enough to cause the film layers to stick to each other.

Oleochemicals based antiblocking agents are designed to prevent two surfaces from permanently adhering to each other. They are incorporated into a polymer to prevent blocking. These products have partial compatibility yet to exude to the surface in a controlled manner under the desired conditions. Use of antiblocking agent ensures better operability, ease of processing, and post product finishing operations.

Slip agents and antislip agents

Slip agents are modifiers used in plastics to provide surface lubrication during and immediately after processing. These agents are added to the plastics during processing. They have limited compatibility and are designed to exude to the surface and provide an invisible coating on the surface, reducing the co-efficient of friction. The primary function of a slip is to reduce the sticking of the plastic to itself by minimising tack.

Contrary to the situation where slip agents are required, sometimes the films are so smooth that bags made from them slide apart when stored or packed on pallets. Antislip additive can be incorporated or sprayed on the surface. Incorporated antislip agents roughen the surface where as sprayed-on products produce a limited tackiness. Packaging bags can, in this way, remain tightly bonded when stacked but easily separated when desired, with the help of antislip agents. Oleochemicals being versatile can thus be judiciously employed both as slip and antislip agents depending on the circumstances.

Antifogging agents

Some industrial products and especially processed food products contain substantial amounts of water and are often stored at low temperatures where water droplets have a tendency to condense on the inside surface of packaging films. This produces a condition known as "fogging" which detracts from the aesthetic appearance of the package. Therefore polymer food packaging materials including film and moulded containers require anti-fog additives to maintain good optical properties and especially where visual effect and appearance is of prime importance.

Oleochemicals can once again be called to the rescue as antifog additives. They have the required compatibility and surface active characteristics to prevent fogging by causing the water droplets to form a continuous film on the inside surface, thus maintain the clarity and aesthetic appeal. Antifogging agents are used at very low levels depending on film thickness and condition of use.

Cling additives

"Cling" describes the tendency of a thermoplastic film to

adhere to similar or dissimilar materials because of the surface properties of the film itself. Thus, a shear load applied to the interface between the two layers will indicate a finite value of share strength, not attributable to friction and not created by any additional adhesive material. Although a peeling action will easily separate the materials, the bond can be remade. The phenomenon may appear as as surface characteristic of the unmodified polymeric material, although it is then commonly destroyed when the film is severely stretched as in stretchwrapping applications.

It may be enhanced by the addition of small quantities of suitable agents to the basic polymer. Cling may be tacky, oily and can be produced by using appropriate additives. This requirement is particularly for PVC, LDPE, LLDPE films to impart cling property to the film to cling itself and also to glass, cellulose of other plastic substrates that may be used depending upon the application.

Viscosity controllers/depressants

Oleochemicals are finding more applications as viscosity controllers in vinyl plastisols. For easy and convenient processing, plastisols must be fluid with low viscosity but must be rough rubbery polymers when cured at a temperature in the range of 130-180°C. Viscosity controllers when added in such formulations in very small proportions, achieve both requirements economically. They also impart some beneficial side effects like more incorporation of filler etc.

The use of viscosity controllers is of more importance in foam leather cloth, crown cork liners or any other article manufactured like handtools or two-wheeler grips made by slush moulding or dip coating where viscosity plastisol is more important. An additional requirement in plastisol processing is the ability to make good, medium density foams. Good control of cell structure during formation and curing is achieved by incorporating such viscosity controllers in the formulations. In the leather cloth manufacture, for example general tendency of the processor is to use kerosene or LAI to give viscosity controlling effects but besides being hazardous to use it is not cost effective as seen obviously because it goes out of the system being volatile whereas oleochemicals as viscosity controllers remain in the system which makes them more effective and more economical in use.

Conclusions

1. Oleochemicals application field, as mentioned earlier is very wide. We have touched a small but significant aspect of relevance considering today's deliberations.
2. Because of the increasing requirements and efforts of polymer manufactures to open up new markets with special products, the development of the new type of the polymers and blends etc; is growing. However these polymers usually bring new processing problems too. These need to be tackled.

Simultaneous debottlenecking and energy savings in both processes via the application of pinch technology

Eric Petela, Principal Consultant, Linnhoff March.

'Pinch technology is fine for large continuous processes where I'm sure it can save lots of energy. However, my process is a simple, small batch processes and anyway, energy costs represent only 5 to 10% of the total operating costs.'

This is a typical statement made by many operators when questioned on the uptake of pinch technology within their company. The statement is a mixture of truth (energy costs may be only 5 to 10%), misconception (the process must be both large and continuous for pinch technology to apply), partial comprehension (pinch technology is an energy saving tool only), reluctance (heat recovery tends to add complexity and reduce flexibility) and, possibly, fear.

If pinch technology were only concerned with energy saving and, to make worthwhile savings, had to be applied to large continuous processes where it then added complexity and reduced operating flexibility then it would, indeed, be of no use to batch operators. Furthermore it would be of little use to those operators of large continuous processes as they, in common with all the process industries, do not want to lose operability and flexibility.

It is not the intention of this article to describe pinch technology in detail there are now many papers which do this adequately(1/2). The intention of this article is to demonstrate how pinch technology is used to debottleneck batch processes whilst also reducing specific energy costs as a useful by-product.

Pinch technology is a simple yet rigorous means of tracking mass and energy flows through a process. As most industrial processes are, essentially, a series of mass and energy flows then any tool which allows careful monitoring of these flows will give the designer and operator a powerful insight into his process. There are now numerous documented case studies of how pinch technology and associated process integration techniques can give benefits such as capital saving in new plant design (3), improved plant flexibility (4), increased yields and reduced effluent (5) and identification of the optimum combined heat and power system (6) in addition to the many hundreds of case studies where substantial savings in energy have been achieved.

Composite curves

Composite curves show, on a single plot, the total heating and cooling requirements of any process together with the limit of heat recovery (the pinch) and the minimum hot and cold utility requirements. For any process the following equation must apply:

tion must apply:

$$A = T + XP$$

where A = actual energy consumption of the process.

T = targeted energy consumption as specified by the composite curves.

and XP = cross pinch heat transfer.

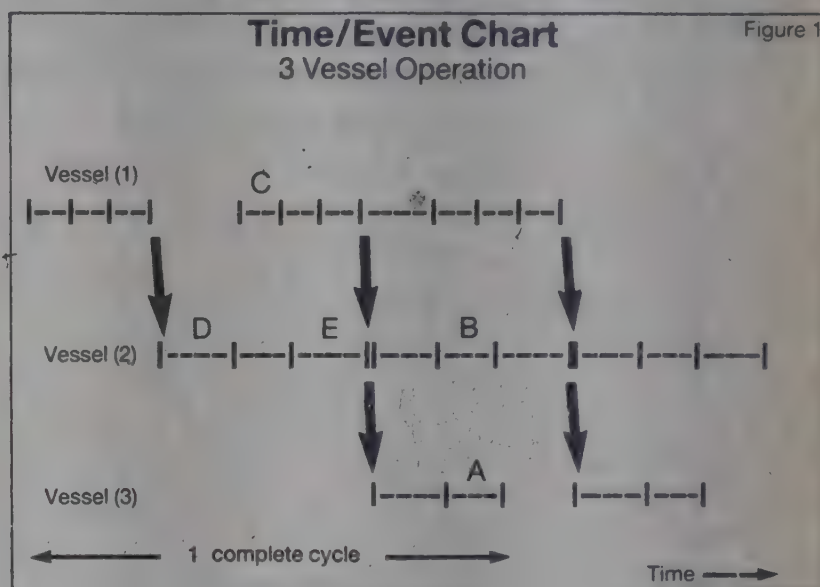


Figure 1.

Whereas the composite curves track mass and energy flows through a process the time event chart tracks operations which consume time. All the operations pertaining to a complete batch are plotted on this chart. Some of the operations will involve no transfer of heat energy, vessel filling, for example. Other operations will represent the hot and cold streams in the pinch analysis. A typical time-event chart is shown in figure 1. This figure describes a three vessel operation in which vessel one is first used to carry out three 'operations'. These operations could, typically be filling, heating and agitation.

Following the three operations the contents of vessel one are transferred to vessel two when a further three operations are carried out. Finally vessel three is used for a further two operating steps. This sequence of operations represent one complete batch or cycle. To maximise output from the plant, batches are stacked up. The time event chart is now used to

identify the limiting operation or bottleneck in the total system. In this case vessels one and three are shown to have an amount of 'freetime' whereas vessel two is being used, essentially on a continuous basis (the critical path). In order to debottleneck the process we need to reduce the length of time that vessel two is required per batch. Reducing operating times in either vessel one or three would merely increase the amount of free time. A reduction in operating time within vessel two would allow free time elsewhere to be exploited. As a result an effective shortening of the batch time is achieved and hence more batches can be completed in any given period of time.

This analysis identifies where action must be taken to get an effective reduction in batch time. In order to make a decision on exactly which operations within the critical path should be addressed we decide to change those operations which would also facilitate energy saving. To get the best system for energy saving the composite curves are now used.

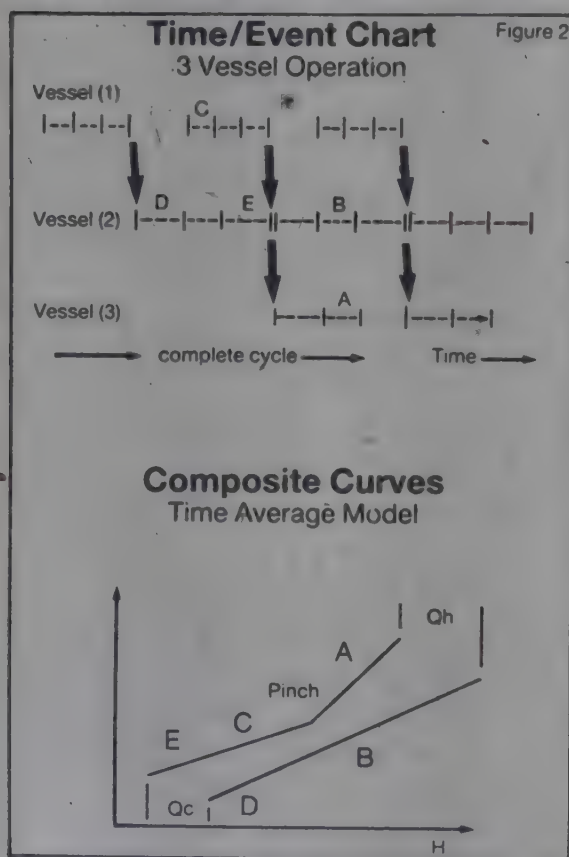


Figure 2

The composite curves for the batch process are produced on a time average basis—typically per batch and used to decide where heat recovery would be appropriate. Heat recovery in batch processes is often limited because hot and cold streams occur at the same time. The time-event chart details the float and hence the potential to make these streams occur at the same point in time without a detrimental effect to the process. In figure two the time-event chart is shown alongside the system composite curves. To facilitate identification of hot and cold streams these are labelled A to E on both diagrams.

Heat recovery A to B is obviously possible and appropriate.

Heat recovery C to D or E to D would be appropriate by the pinch principle (only one of the options is required as some of the heat must be rejected to the cooling system). The time-event chart shows that currently neither scheme is possible. However, the free time in vessel one can be exploited to move the timing of operation C so that it coincides with operation D. (Note that length of time taken for C could also be extended so as to more closely match the time taken for D without increasing the effective batch cycle time).

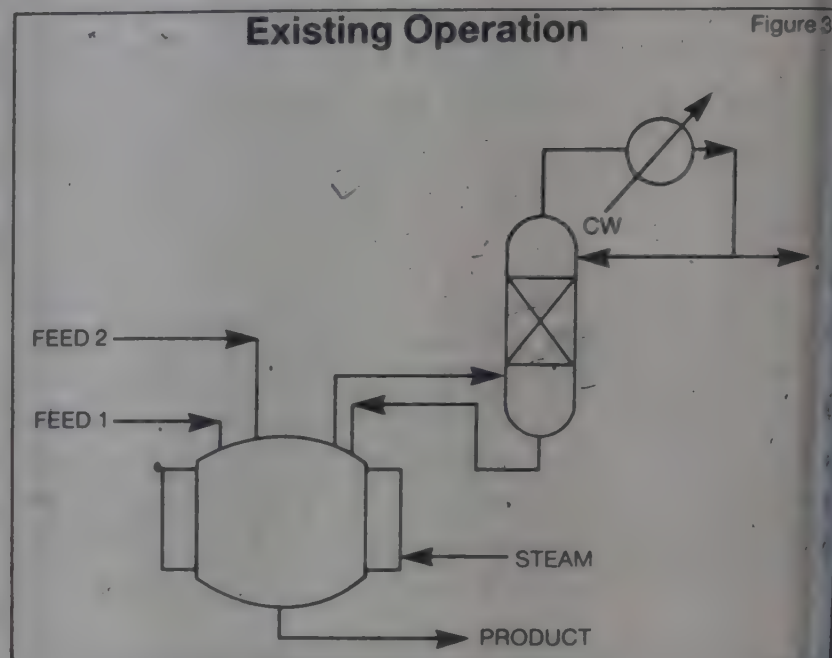


Figure 3

Heat recovery E to D is clearly not possible as currently both operations occur within the same vessel. Two alternatives are however possible. Cooling of E could be carried out externally thus removing it from the critical path (the composite curves showing that some cooling is necessary) or operation E could now be carried out in a new vessel designed so as to allow heat recovery between streams E and D. In either case operation E is removed from the critical path and hence reduction in effective batch time is achieved.

Batch Operation

The procedure can now be demonstrated with reference to the simple batch operation shown in figure 3. The process under consideration comprises a single batch reactor into which two feeds are introduced. The feed materials are heated to an intermediate temperature by the application of steam to the vessel jacket at which point an endothermic reaction takes place. The length of time allowed for this reaction has been the subject of detailed analysis in as much as increased reaction time produces a higher yield but increases the batch length and hence reduces total plant capacity. Increased reaction time also means higher energy consumption. After the

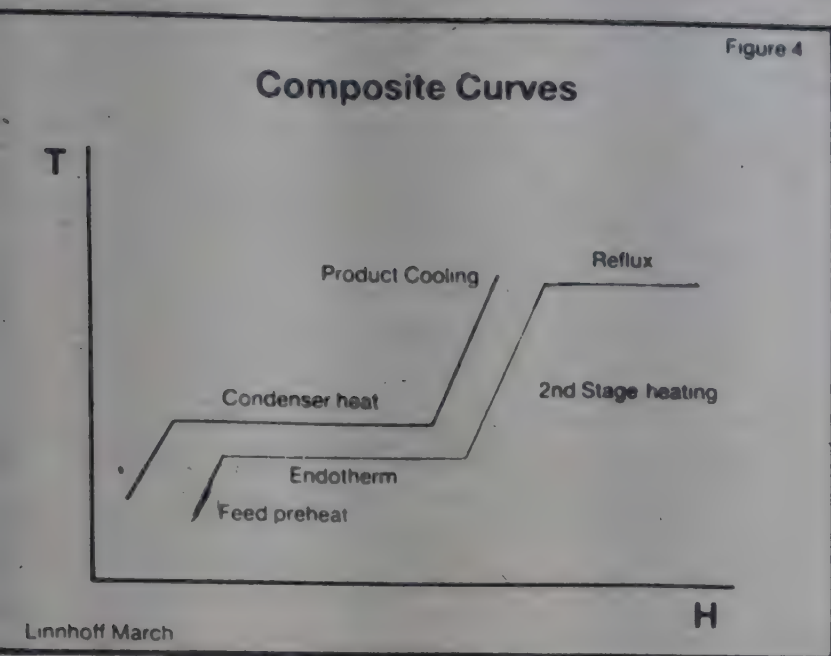


Figure 4

preset period of time has elapsed the vessel contents are taken to a higher temperature at which point the solvent is removed via the column and reflux system, leaving behind a less volatile product which is cooled and finally discharged.

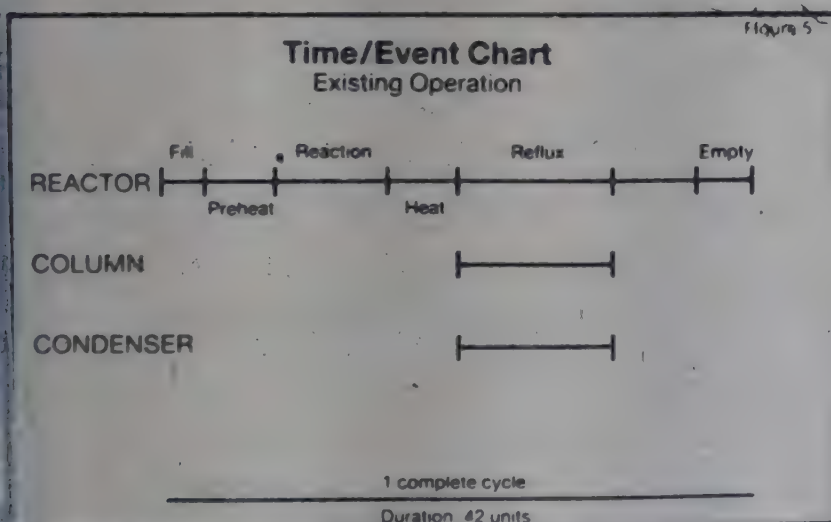


Figure 5

The system composite curves for this sequence of operations are plotted on a time-average basis in figure 4 and analysis of the current processing schedule gives the time-event chart shown in figure 5. A total batch time of 42 units is indicated. In the case of this simple operation the reactor quite

obviously represents the critical path and operations must be removed from the critical path to achieve the desired debottlenecking. Removal of any operation will reduce the cycle time and hence allow more batches per unit time.

At this stage, however, the composite curves are used to define the ideal heat recovery situation and a decision on which operations are to be removed from the critical path is taken so as to facilitate the optimum heat recovery. Note that although the decision is taken here so as to optimise heat recovery, the same procedure can be used to produce other benefits such as increased yield or reduced effluent. The composite curves show that significant heat recovery is possible by using condenser heat to both preheat the feeds and supply the necessary endothermic heat of reaction. To accomplish this heat recovery a new vessel (pre-treater) must be added and the resulting time-event chart is shown in figure 6. To complete one batch now takes 32 units of time—a saving of 23 percent which is then simply translated into 23 per cent more product per day.

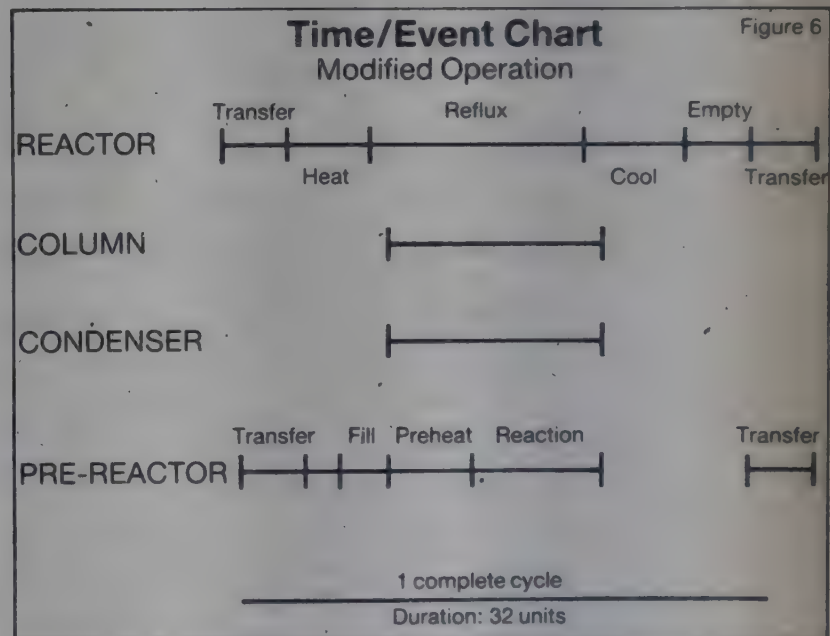


Figure 6

The modified processing scheme is shown in figure seven. A new condenser provides a supply of pressurised hot water which is used to supply the necessary feed preheat and endothermic reaction duties. A small additional benefit in this case is that with the new configuration and reduced energy consumption it is economic to increase slightly the initial reaction time and hence a small yield improvement is achieved.

The case study described relates to a simple batch operation producing a single range of products, and was deliberately chosen as such to demonstrate the procedure. In

Proposed Modified Title

Figure 7

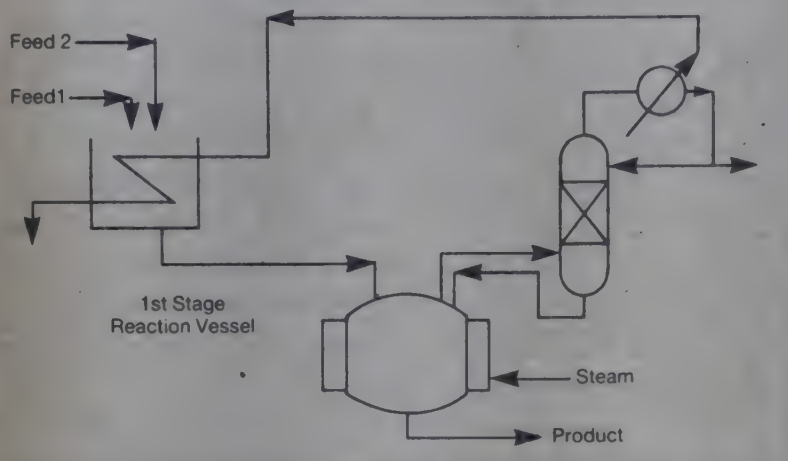


Figure 7

practice there are many such processes but there are also batch processes which make many products or which can have different configurations or which have seasonable demands - does the procedure still work? The procedure has been suc-

cessfully applied by Linhoff March to a whole range of batch process industries including food and drink, pharmaceuticals and fine chemicals and to processes having a whole range of operating parameters and constraints. Debottlenecking in the range five to 25 percent has been achieved with simultaneous reduction in energy consumption. Additional benefits have been increased flexibility (equipment added has allowed the operator to choose between more production or less energy use per tonne of product), increased yields and reduced effluent. On a final note, not to forget the potential for saving energy it is interesting to note that the potential to save energy in batch processes is often far greater than that in continuous processes. It is not unusual to find potential energy savings in the range 30 to 50 per cent and in one recent study potential energy savings of over 300% were identified: a net importer of energy was turned into a net exporter! Unfortunately, that was the exception.

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Science Briefs

PROCESS KNOW-HOW FOR MANUFACTURE OF DEOILER

The Regional Research Laboratory (RRL), Jorhat, has developed a cationic polyelectrolyte which can be used as a deoiler. When applied to the oil in water emulsion in less than 20 parts per million concentration, the emulsion is broken down quantitatively and oil separates to the surface. A deoiler is a chemical used in the oil industry for removing oil from the large volume of associated water effluent. Deoilers are usually organic polyelectrolytes. They break down the oil in water emulsion quantitatively and help the oil to float to the surface of the water, which can then be easily skimmed off. The resultant water is almost free from oil which can then be disposed off.

The deoiler produced in the laboratory has been tested by the Oil and Natural Gas Commission at Sibsagar, the Oil India Limited at Duliajan and RRL, Jorhat with the effluent water obtained from different oil fields located in the north eastern region, and has been found to be effective in removing as much as 90 per cent of the oil present in the water. The RRL has signed an agreement with Poly Products (Chemicals Division), Guwahati, under which the laboratory shall undertake the development of process know-how for the manufacture of deoiler on a 40 kg/batch-scale. The laboratory will submit a detailed report of work undertaken to the firm and will demonstrate it the process know-how developed.

-- PTI Science Service

BIOGAS FROM IPOMOEIA STEMS

Stems of the common herb, *Ipomoea fistulosa* which are often discarded into compost pits or burnt in the open air, could be used to generate biogas, recent research shows. After extensive tests and analysis, scientists at the Department of Chemical Engineering, Univer-

sity of Roorkee, showed that stems of *Ipomoea fistulosa*, when maintained under neutral pH conditions, produced more biogas than cattle dung.

Using different ratios of *Ipomoea* stems and cattle dung, they found that a mixture containing 75 per cent cattle dung and 25 per cent plant stems, produced the maximum quantity of methane — 449 litres per kilogram of volatile solids. A digester containing only *Ipomoea* stems, maintained at a constant neutral pH, produced 555 litres of biogas per kg of volatile solids, the scientists S.K. Sharma, J.S. Saini, I.M. Mishra and M.P. Sharma said, reporting their findings in the journal "Biological Wastes".

As the *Ipomoea* stems have a low content of lignin, a higher quantity of cellulose is available for bacterial degradation, compared to cowdung. The carbon : nitrogen ratio was also found to be higher in *Ipomoea* stems, compared to cattle dung and effluent slurry which served as a control. The stems also had the highest solubility in hot water and a mixture of ethanol and benzene.

The team also studied whether the size of the stem pieces affected biogas production. The scientists found that the highest methane yield was obtained when 0.4 mm-long pieces were used. The findings suggest a useful and alternate source of energy for rural areas.

-- PTI Science Service

TECHNIQUE TO STABILISE RICE BRAN OIL

The Central Food Technological Research Institute (CFTRI), Mysore, has developed a commercially viable process to stabilise rice bran so as to improve extraction of edible oil from it.

Rice bran, a valuable byproduct of the rice milling industry, holds considerable potential as a source of edible oil.

Rice bran is, however, vulnerable to enzymatic spoilage, and one of the major problems in exploiting rice bran either for human consumption or for the extraction of edible oil is its high lipase activity. The enzyme is activated after milling and it splits the oil present in the bran into free fatty acids (FFA), partial glycerides and glycerol. The rate of hydrolysis is so high that the free fatty acid content may rise to 20 per cent within a day and upto 70 per cent in a month. Other deteriorative reactions lead to changes in the bran's colour, odour and flavour and make it bitter. The bran tastes soapy and unpleasant just a few days after milling. The problem can be minimised either by extracting the oil from fresh bran, or stabilising the bran.

Stabilisation is a technique to arrest the activity of lipase, which is otherwise promoted by the presence of moisture in the bran. So, if the bran is dried and put in a closed plastic-lined gunny bag, it remains dry and the lipase remains inactive, even if not destroyed. CFTRI has successfully developed an open pan heating system on a small scale and different types of stabilisers some of which have been successfully tested under field conditions and installed in rice mills.

CFTRI recently developed a commercially viable process which does not provide any of the optimum conditions required for lipase activity. The process consists of lowering the pH by spraying hydrochloric acid in a fine mist. CFTRI has developed equipment which is simple, cost-effective and has built-in safety, for operation in large, medium and even in huller type mills.

Rice bran stabilisation has been demonstrated in some rice mills at Mehboobnagar and Miryalguda, two rice-milling towns in Andhra Pradesh, and at four rice mills belonging to the Food Corporation of India at Thanjavur, Mannargudi, Semenarkoil and Chidam-

baram in Tamil Nadu. Rice bran, thus stabilised, retains its quality for a long time. The treatment has no adverse effect on the colour of bran or oil, extraction of oil or on any other characteristics. The feeding quality of the stabilised bran remains unaltered and it is not vulnerable to insect attack. The plant and machinery are corrosion resistant.

A test-kit for a quick estimation of the free fatty acids in the rice bran has also been developed at CFTRI. The kit is useful in sorting out batches of rice bran having free fatty acids. The kit can also measure the pH and check whether the bran is stabilised or not. The kits, priced at Rs. 1000 each, are very popular among rice millers. Oil is extracted from the stabilised bran, using hexane as a solvent. The oil has to be further refined for cooking, by removing wax, free fatty acids and undesirable odours.

-- PTI Science Service

NEW VIRUS DETECTION TECHNIQUE FROM ICRISAT

Scientists at the International Crop Research Institute for Semi-Arid Tropics (ICRISAT), Hyderabad have developed an improved version of the ELISA test, which can help detect plant viruses and has potential application in medicine. The ICRISAT researchers, led by Dr. D.V.R. Reddy, said that the new standardised method uses an enzyme penicillinase to convert penicillins into penicilloic acids. The technique costs less than one-fifth that of conventional methods.

The enzymes currently used in the enzyme-linked immunosorbent assay (ELISA) are alkaline phosphatase, horseradish peroxidase and urease, which are costly and not easily available. Some of these substrates have potential carcinogenic properties and are hazardous, the scientists said. The idea to work on the new enzyme came from the work done by an Indian scientist, Dr. Usha M. Joshi in 1978, while she was

with the Institute for Research in Reproduction, Bombay, ICRISAT scientists said.

Penicillinase is easily available in India, while the other enzymes have to be imported. ICRISAT scientists also found during six months of research that certain penicillins cannot be used in the ELISA test. The ones best suited are based on sodium and potassium widely available in the country.

The ELISA test is very essential in detecting viruses in human beings. It has become popular because of its importance in identifying the Acquired Immune Deficiency Syndrome (AIDS) virus. ICRISAT scientists said the improved ELISA test could be applied in the medical field in a cost effective manner. They also claim that using penicillinase in the ELISA test for agricultural purposes could save considerable amount of foreign exchange.

-- PTI Science Service

EXTRA FINE CONTROL NEEDLE VALVES

The National Physical Laboratory in New Delhi has developed two types of extra fine control needle valves that will find use in processes that involve admitting gases into evacuated chambers at controlled rates. Some of these processes are gas filling of electronic tubes at low pressures, flushing, discharging, cleaning and sputtering. The small flow rates are best arranged by the use of fine control needle valves.

One type of the extra fine needle valve developed at the NPL is for pipeline mounting and the other is for panel mounting. These models can be used for the accurately controlled supply of gases into a vacuum chamber in the pressure range below atmospheric pressure down to one-millionth of a torr. Both the models have an approximately 18-turn 0-100 division dial. An anticlockwise turn of the dial opens the gap between a needle and a low conductance seat

which helps control the flow of the gas. Metal bellows are used to make the valves leakproof and reliable for work in high vacuum. A strong return spring eliminates backlash.

-- PTI Science Service

SILVER FROM WASTE PHOTOGRAPHIC SOLUTIONS

The National Physical Laboratory in New Delhi has developed a chemical process for the extraction of silver from waste hypo solutions which are available from the photographic industries particularly from X-ray washing films. In the process, the breakdown of the hypo solution is done by sodium hydroxide and sodium sulphite at room temperature. After two washings, the precipitate settles down within 10 minutes.

The clear solution can be decanted off and the precipitate is filtered through cloth, washed with water and dried in the air. After proper drying the precipitate is fused with potassium carbonate, potassium nitrate and borax in a clay crucible. According to NPL, nearly 99 per cent of the silver present in the solution can be recovered and the purity of the extracted silver is greater than 99 per cent.

-- PTI Science Service

MANUFACTURE OF HUMAN SKIN ON THE NEAR HORIZON

The discovery of the epidermal growth factor will make possible the manufacture of human skins in the near future, reports Span. Recent clinical trials by Ethicon, a division of Johnson and Johnson, indicate that the epidermal growth factor, which stimulates skin cells to multiply, heals deep ulcers of the skin in half the normal time. The growth factors can be used to treat patients directly, but they are also being used in the laboratory to produce artificially grown skin. Sheets of lab-grown skin are then applied to skin ulcers or second degree burns to speed up healing.

Dr. Howard Green of the Harvard Medical School starts with cells from the foreskin of circumscribed infants. The cells, which naturally contain a high concentration of growth factors to begin with, are grown in a laboratory dish in the presence of the epidermal growth factor. When applied to the wound, the sheets protect the site of injury and provide a rich source of growth factors to accelerate the body's natural healing process.

Chiron, a biotech corporation in Emeryville, California, is also exploring the epidermal growth factor's use in repairing injuries to the surface of the cornea that refuses to mend. In tests on 60 patients, one-third of the eye injuries healed completely and one-third healed partially. This was a tremendous result for a first trial, the Span report says.

-- PTI Science Service

BACTERIOPHAGES PINPOINT PATHOGENS

Researchers in Britain have shown that bioluminescence could be used as a novel means of rapidly screening food samples for pathogens such as salmonella and listeria bacteria. The tests are being developed by scientists at the Amersham International, Buckinghamshire, England, in collaboration with researchers at Nottingham University's faculty of agriculture and food science, reports the journal "Chemical and Engineering News".

The screens centre on reagents consisting of bacteriophages specific to individual pathogens into which DNA, or deoxyribonucleic acid, that codes for the production of luciferase has been introduced. When the bacteriophages invade the pathogens, they would make the organisms luminescent.

The intensity of the emitted light would be an indication of their concentration in the sample. Researchers Gordon Stewart and Will Waits at Not-

tingham currently are developing reagents that will identify enteric or faecal microorganisms. Although not all of these are pathogenic, their increase in concentration would be a strong indication of food contamination, the journal said quoting Stewart. A prototype hygiene test may be ready for evaluation by year-end. A specific test for salmonella will take up to 18 months to develop, and one of listeria could take twice as long, the journal said.

-- PTI Science Service

WATER RECYCLING TECHNIQUE BY NEW ADSORBENT

The Tokyo Metropolitan Textile Research Institute has developed a technique to reuse water for cleaning the dyeing textile in a dyeing plant by eliminating suspended dirt with a special adsorbent after use. The new adsorbent has 40 times as high adsorbency as activated carbon pellets and it can save about 30 per cent of water by recycling the purified cleaning water. The costs

for water and treatment are a high proportion of production costs for the dyeing industry and the effective use of water has been a big issue, the journal "Techno Japan" reports. The application of the new technique will lead to a large reduction in cost.

The adsorbent the institute has developed increases the absorbance of cotton. After acrylamine is reacted with cotton fibre, the amide is changed to an amine to make modified graft cotton which can absorb a dye dissolved in dirty water, the journal said. The modified graft cotton has 40 times higher absorbency as the present activated carbon granules according to the test made by the institute and in the case of reduced absorbency, soaking in a 0.05 per cent concentration of caustic soda solution separates the absorbed particles allowing recycling of the adsorbent.

In dyeing plants, it is necessary to wash repeatedly after dyeing in order to avoid dye losses and colour changes

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which will occur in cleaning after wearing the finished textile product and a large volume of water has been required for this. The use of the new absorbent can save about 30 per cent of the cleaning water.

-- PTI Science Service

NEW CANCER DIAGNOSTIC TEST

Scientists at the Weizmann Institute have learned how to employ a naturally occurring body enzyme creatine kinase to observe changing cell activity within hours. Using the enzyme creatine kinase (CK), the scientists can see immediately how living organisms react to a specific biological substance before other changes start occurring and confuse their observations. The use of CK as a marker has been considered as a possible early test for cancer.

The usefulness of CK as a signpost of biological reactions was seen in

laboratory experiments in which hormones were applied to tissues by a group of scientists led by Professor Alvin M. Kaye. The team applied the hormone oestrogen to surgically remove breast tumours and studied the activity of CK. They found that the malignant tumours reacted differently to oestrogen stimulation than benign tumours.

Other tests using CK as a measurement revealed that Vitamin D could be important, not only in the growth of bones, but also the brain and kidneys.

-- PTI Science Service

SILICON CHIPS STAY COOL FOR GREATER PURITY

Electronics companies could soon increase the number of components on a chip from millions to billions, thanks to a researcher in the US. Al Tash at the University of Texas in Austin has developed a new process that enables silicon crystals to grow at much lower

temperature, reports the journal "New Scientist". These crystals have fewer defects than ordinary silicon crystals.

The active part of a silicon chip is usually a single crystal of silicon. Normally factories make these crystals by heating a substrate to 900 degrees Celsius in the presence of a gas called silane. When the gas comes into contact with the hot substrate, it reacts with it to form a layer of silicon. In time, this process builds up a single crystal of silicon.

Although manufacturers take great care to ensure that the crystal is free of defects and impurities, some inevitably arise due to the high temperature of the reaction. These defects pose few problems in today's chips, but they are holding back the development of the next generation of electronic devices. Researchers claim that these devices will be of orders of magnitude faster than those available today, because it will be possible to pack many more components onto a chip.

Tash's technique enables single crystals of silicon to grow at 300 degrees Celsius. He does this by supplying the extra energy for the reaction from an alternating electromagnetic field. Tash excites atoms of an inert gas, argon, by placing them in an electromagnetic field. These atoms then form an energetic plasma of electrons and ions, which in turn pass their energy on to the silane gas, which provides them with the energy to form single crystals at 300 degrees Celsius.

-- PTI Science Service

ELECTRIC WATER DIVINER

Farmers will soon be able to monitor the effectiveness of irrigation schemes using a new probe developed by scientists in Australia. The probe sends an electric pulse down a wire that the farmer inserts into the soil. The time it takes the pulse to travel down to the end of the wire and back depends on the amount of water surrounding the wire.

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Soil is not the only material that the probe can test. For example, surveyors can use it to check the water content of concrete structures or to trace and monitor leaks from pipes, reports the journal "New Scientist".

The electric field from the pulse leaks into the surrounding material. Any molecules that can be polarised align themselves with the passing field and so slow the pulse down. Water polarises much more easily than most materials, so the speed at which the pulse travels through the wire will depend largely on the amount of moisture in the soil surrounding it.

The probe, developed by researchers at the Commonwealth Scientific and Industrial Research Organisation in Melbourne comes in two forms. One has three metal spikes, like a fork, and the other has a single spike and lies on top of the material.

AUSTRALIANS INCREASE THE PRESSURE FOR NITROGEN

Aerosol cans could soon be using nitrogen as their propellant instead of chlorofluorocarbons (CFCs). Nitrogen has to be kept at a very high pressure to keep it in its liquid form, and it is far too expensive to strengthen the whole can. An Australian company has now found a solution to the problem, reports the journal "New Scientist". Overseas Technology has developed a can that stores liquid nitrogen in a small metal container, similar to the bulbs used in soda syphons. The bulb and its valve transfer nitrogen evenly to the liquid in the can.

CFCs are currently used in aerosol cans because they are very unreactive and do not corrupt the contents. Unfortunately, they also damage the ozone layer and contribute to the greenhouse effect, so companies have been looking for an alternative propellant. Nitrogen is a good candidate because other than being unreactive, it is cheap and plen-

tiful. Nearly 80 per cent of the air that we breathe consists of nitrogen.

According to Andrew Moon of Overseas Technology, manufacturers should easily be able to incorporate bulbs into their cans without disrupting their production lines too much. "The system has been designed to be totally compatible with packaging methods, so it can take its place in filling lines without major changes", says Moon.

-- PTI Science Service

POLYPROPYLENE WITH HIGH THERMAL RESISTANCE

Nissam Motor Company Limited, Nissan Shatai Company Limited and Mitsubishi Petrochemical Company Limited have co-developed a polypropylene with high thermal resistance to be used for the body of automobiles. The thermal deformation temperature is raised by 30 to 40 per cent by changing the molecular composition or by adding

filling in order to be put in a high temperature body coating line. Some engineering plastic with high thermal resistance has been used for the outer sheet of the body. However, the price is so high that it has not become common. Achievement of thermal resistance of inexpensive general purpose resin polypropylene as good as an engineering plastic will open up the possibility of using resins for the entire automobile body. This polypropylene is used for some multi-purpose vehicles and the number of models using the polypropylene will be increased in the future, reports "Techno Japan".

PP is a general purpose resin which is also used for baths. It is light and strong but it is deformed at a temperature of 90°C. The polypropylene has not been used in a body coating line where the body outer sheet is coated by baking at a temperature exceeding 100°C. The three companies have succeeded in the development of a poly-

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propylene which is heat resistant up to a temperature of 120°C and has high rigidity by adding a hard filling of calcium carbonate. Thus the polypropylene can be coated in a conventional line now. First, the outer sheet under the rear lamp which is produced by Nissan Shatai was made and commercialised using this newly developed polypropylene.

Each motor company has been making intensive efforts to use light and non-corrosive resin for body outer plates. Because of thermal resistance, engineering plastics including modified polyanid, which costs 7 or 8 time more than iron have been used for some parts of an automobile. The high price has been a big problem for the expansion of the engineering plastic market.

-- PTI Science Service

FUEL CELLS AS ANTI-POLLUTION DEVICES

Growing concerns about air pollution and the greenhouse effect have stirred new interest in fuel cells, devices that generate electricity through chemical reactions. The appeal of fuel cells is clear. They are quiet, they produce little pollution and they are more efficient than conventional power plants at converting the energy in coal, oil and natural gas into electricity.

But for nearly 30 years, high costs and the reluctance of both equipment manufacturers and electric utilities to plunge into new generating technologies — after disappointments with nuclear power — have kept the cells always on the horizon. Fuel-cell advocates say the time may now be right to overcome those obstacles.

The concept of a fuel cell was described as far back as 1839, although the first practical applications came in the United States space programme of the Sixties. Fuel cells provided power for the Gemini and Apollo missions and three 175 fuel cell units generate the

on-board electricity for the space shuttles.

A fuel cell is a form of continuously operating battery. Inside the cell, a fuel, typically hydrogen, is passed over a negatively charged pole, or anode, where electrons are stripped off through catalytic action. The hydrogen ions that result then flow through conducting substances known as electrolytes towards a positively charge pole, or cathode.

The electron flow produces an electric current. The hydrogen ions are left to combine at the cathode with oxygen, producing heat and water. The oxygen needed for the reaction can usually be taken directly from the air around the fuel cell.

Since the fuel is not burned in a conventional sense, there are no pollutants — in a cell with pure hydrogen and oxygen, water is the only byproduct. In others, depending on the fuel used, carbon dioxide is also produced, although in smaller quantities than from conventional processes.

Fuel cells are also more efficient than conventional power plants at converting hydrocarbons into electricity because they do so through a direct chemical reaction. In a conventional plant, hydrocarbons are burned to boil water, creating steam that drives a turbine to generate electricity. Some energy is lost with each step.

A conventional power plant is 34 or 35 per cent efficient. A fuel cell is as much as 45 per cent efficient. Its advantage can be even greater if waste heat is captured in the form of steam and used to drive a conventional generator. Then the efficiency soars to between 70 and 80 per cent, advocates say.

Moreover, they say, the steam produced by a fuel cell is generally cleaner than that in a normal power plant, causing less corrosion.

-- The Hindu

CONTROVERSIAL HULL COATING

The continued improvement in hull coatings has prolonged vessel life and saved shipowners considerable time and money by reducing downtime and repairs. However, concern over possible environmental hazards that certain antifouling compounds used to discourage marine growths may pose, has prompted international investigation and consequent legislation to control the use of coatings containing the revolutionary biocide, tributyltin (TBT). It has long been recognised by the marine industry that the introduction of "TBT copolymer antifouling technology" has led to major advances in vessel operation. As a result of TBT, vessels can now trade in the harshest fouling environments for periods of up to five years without suffering fuel penalties, much longer than was previously the case.

The development and introduction of TBT antifouling was the work of International Paint, and its marine coating division, Britain's leading manufacturer of paints and coatings for the marine industry. Having developed the antifouling that gave the best protection, International Paint, one of the few active marine paint manufacturers in the United Kingdom, was the first to recognise the need to find an alternative product in the face of increasing worldwide legislation against the use of tributyltin.

Currently operating in 34 countries worldwide and conducting its extensive product development from its facility at Felling in northeast England, International Paint has coated nearly 8000 vessels with its Intersmooth and Interswift TBT copolymer antifoulings. The company conservatively estimates that by using this technology the shipping industry is saving over U.S. \$200 million in fuel costs per annum, in addition to savings from extended operational periods.



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However, despite these obvious advantages, TBT, because of its high toxicity, is now being viewed in a different light — as a threat to the marine environment. Concern has largely been focussed on TBT coatings on small craft such as workboats, fishing vessels and especially yachts. The latter have come under particular scrutiny because of the considerable periods of time for which they remain stationary in harbours, marinas and other areas of poor water exchange.

As a result, in certain parts of the world, principally Europe and the United States, legislation has been introduced to control the application of antifoulings containing TBT. Legislation against the use of TBT has been slow to have an effect and can be summarised as follows. In Europe, several countries including the United Kingdom and France, have introduced laws but the European Community proposes Community-wide legislation to ban TBT this year. To date, there is no indication that such legislation will affect vessels greater than 25 m. in length.

-- The Hindu

TOWARDS CLEANER VEHICLE EMISSIONS

The tough limits on pollutants in car exhausts proposed by the European Commission will have to be tightened

still further if the EEC adopts a new test based on more realistic driving conditions. The test may also change the technical options for making cleaner cars, since it shows that "lean-burn" engines are dirtier under realistic driving conditions than they are under the present test.

Under the present European test, cars are put through the equivalent of four kilometres of driving at 40 kilometres per hour. This test does not represent European driving now, which includes more long-distance driving on motorways. In 1985 the European Commission asked car companies to redesign this test to bring it into line with the American version. This would allow them to design cars to meet comparable standards in Europe and the U.S.

The car manufacturers proposed a test in February which adds an "extra-urban cycle", simulating an extra seven kilometres, at speeds from 90 to 120 kilometres per hour, to the old "urban cycle" test. The manufacturers are confident that the commission will approve this new test. Leon Van Beckhoven, of the Dutch environment ministry, and Rudolf Riikeboer of the Dutch Road Vehicles Research Institute, have now tested a variety of engines under the new cycle and found that the most dramatic effect of this new cycle is on emissions of nitrogen oxides (NO_x), the

chief culprit in photochemical pollution caused by cars. The researchers found that lean-burn engines emit five times as much NO_x during fast driving as they do under the old urban cycle, but that the NO_x emitted by cars equipped with closed-loop, three-way catalytic converters is still low. Their results showed that under the new cycle lean-burn engines even when equipped with oxidation traps, which burn off particles of hydrocarbons, could not meet the American standards. Cars equipped with catalytic converters met all the requirements.

Van Beckhoven admits that cars with catalytic converters still emit much more carbon monoxide, especially when the engine is cold, than cars with a lean-burn engine combined with a closed-loop catalytic converter. The fuel could burn lean when the car was started, so reducing the carbon monoxide emitted by the cold engine. As the engine heated up, carbon monoxide emissions would fall and NO_x emissions start to rise. The fuel mixture could then be enriched, and the catalytic converter brought into play. Such a car could easily meet the U.S. standards, says van Beckhoven, at little extra cost. He claims that combining lean-burn engines and closed-loop catalysts would be relatively easy since both technologies use the same kind of feedback loop to control the fuel mixture.

-- The Hindu

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NEWS FROM ABROAD

EC APPROVES PROPOSALS FOR SINGLE ENERGY MARKET

The European commission has approved a series of measures aimed at creating a unified energy market in Europe. The proposals concern efforts to increase trade in electricity and natural gas within the EC, improve price transparency for the industrial consumer and coordinate energy investments in national projects.

At present, energy costs vary widely between member states, and industries are often subjected to varying competitive restrictions and taxes. According to Cefic, the European chemical industry federation, energy costs amount to, on average, around 10 per cent of the chemical industry's expenditure and can, in some basic products, be as high as 60-80 per cent of the variable costs of production.

A reduction in energy costs is therefore vital, especially in order to remain competitive with the US and Japan, says Cefic.

The measures will facilitate cross-border exchanges of electricity and gas, even if this involves crossing a third state. For example, Spain will no longer be able to object to the transport of electricity through its grid from France to Portugal. This will also even out generating capacity surpluses and shortfalls in different member states.

Currently, under 4 per cent of energy consumed is reported as being traded between EC states.

The commission estimates that greater cross-border trading in electricity could result in savings of around \$1.2bn by 1992.

One proposal will oblige national utilities in member states to communicate price data to the commission twice a year to give a better price overview. Member states will also be obliged to inform the commission on investment plans for national energy plants.

However, as regards consumers the proposals do not go far enough, said Mike Cockburn, Cefic's director for petrochemicals and energy. The problem remains that compared to producers — who can influence government decisions — consumers do not have as strong a lobby, he said. The proposals are "a step in the right direction, but do not go as far as we would have liked," he commented.

The principle of "common carrier", where electricity and gas is purchased directly by the industrial user from a producer in another member state without having to go through the national distribution company, has yet to be agreed upon.

GIST-BROCADES DROPS ACF BID

The proposed acquisition by Dutch healthcare and biotechnology company, Gist-brocades, of its rival, ACF Holding, has fallen through after Gist pulled out of the deal just before the final agreement was due to be signed. Gist's chairman, Gijs Bresser, a main

proponent of the acquisition, has resigned in protest. The merger would have resulted in a company with a turnover of Dfl.3bn (\$1.4bn).

The tender offer, valued at almost Dfl.57/share, was well above ACF's stock price at that time and Gist is reported to have decided the cost was too high. Gist informed ACF that the decision was not connected with the merits of the intended merger, but was due to a crisis within Gist's management. ACF said it was "unpleasantly surprised by this decision, taking into account the development and phase of the negotiations."

Executives from both companies then attempted to realize the main objective of the acquisition and decide on the future of the profitable 50:50 pharmaceuticals joint venture, Brocacef Holding. Each company offered to buy out the other's share in the joint venture, but no conclusion could be reached.

ACF denied reports that Gist's withdrawal from the agreement was the result of last-minute demands by ACF to increase the price of the tender offer. The companies have not ruled out further negotiations on the disposition of Brocacef Holding.

With the failure of the bid for ACF, some commentators forecast that Gist may become the subject of a takeover.

ISRAEL CHEMICALS SEEKS BUYERS

Israel's ministry of finance has sent detailed proposals to fifty companies inviting them to take a controlling stake in the government-owned Israel Chemicals.

Bids are expected to be placed by September this year and the transaction completed by February 1990.

The government intends to keep a 46 per cent share in the country's largest exporter. A further 4 per cent stake will go to employees. Potential buyers for the remaining 50 per cent of the \$400m company have been earmarked in both the US and Europe.

ANGLO WINS COALITE TAKEOVER BATTLE

Anglo-United has won shareholder approval for its hostile £478m (\$788m) cash bid for its fuel distribution competitor Coalite, a company six times its size. The Coalite board had rejected both the original offer price of 425p/share and the increased pri-

ce of 475p as not reflecting the company's true worth.

Anglo-United will now begin the process of restructuring Coalite to focus on its core businesses of fuel distribution and chemicals. Peripheral activities will be sold off to repay borrowings in what has become one of the UK's most highly leveraged takeovers.

PROCORDIA MOVES INTO ABTEI PHARMA

Swedish group, Procordia has acquired a 25 per cent holding in the West German healthcare concern, Abtei Pharma. Abtei Pharma is one of the fastest growing natural healthcare companies in the West German market. It is forecasting a turnover of around Skr200m (\$30.9m) in 1989.

The move will contribute to the continued strong development of

Abtei Pharma, opening up new markets for it in Scandinavia and providing it with increased resources for R&D, said Bo Johansson of Procordia Food. Procordia Food holds around 40 per cent of the natural healthcare market in Sweden.

EC GIVES GO-AHEAD FOR SALE TO R-P

The European Commission has given its approval for Monsanto's proposed sale of its bulk analgesics business to Rhone-Poulenc. The commission decided that the move would not give Rhone-Poulenc a dominant position in the market for the products involved.

The UK's monopolies and mergers commission will not come to its decision until 21 September.

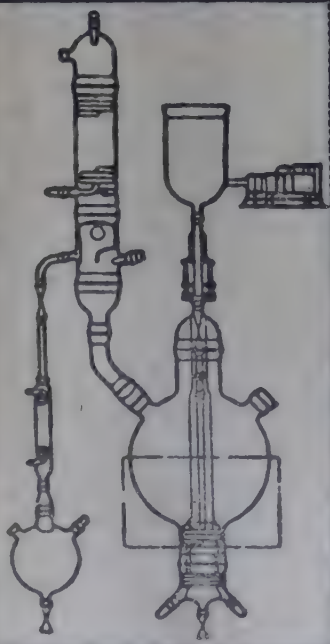
SOLVAY MULLS BUY

Electro Chloro, a Solvay subsidiary in Brazil, is reported to be negotiating the acquisition of Hansen's Brasivil, a PVC producer based in Santo Andre, Sao Paulo state. Sources in the petrochemicals industry value the sale at \$100m.

The negotiations include Brasivil's 35 per cent owned subsidiary, Companhia Paulista de Monomeros (Copamo), a VCM producer which is already 65 per cent owned by Electro Chloro. Copamo currently produces 120,000 ton/year VCM, of which 50,000 ton/year is passed on to Brasivil which also imports 20,000 ton/year from Argentina to produce 70,000 ton/year PVC. Electro Chloro has a PVC capacity of 110,000 ton/year.

Solvay in Belgium confirmed that talks were under way concerning Brazil, but could not specify the company involved.

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BIOTECHNOLOGY PLANT FROM SULZER/MBR INAUGURATED IN MOSCOW

The new Shemjakin Institute of Bioorganic Chemistry of the Academy of Sciences of the USSR was officially opened in Moscow on June 28, 1989.

The Institute was built and equipped jointly by Terasbetoni OY/Helsinki (building and services) and OWEG GmbH/Vienna (equipment) in cooperation with v/o Techmashimport/Moscow at a cost of some US \$70m.

The Biotechnological Research and Experimental Production Center of the Institute — one of the most modern of its kind in Europe — will facilitate in-depth research of various technological processes in the fields of microbiology and biotechnology.

The Sulzer subsidiary MBR Bio Reactor AG (8620 Wetzikon/Switzerland) played an active role in the planning stage and assisted Prof. S. V. Belayev, Director of Research at the Institute, in defining part of the project. MBR was subsequently entrusted by OWEG with the supply of biotechnological equipment covering an extensive range of small and large-scale bioreactors, complex measuring and control systems as well as the related engineering. The plant was built to accord to the highest safety standards (P3) for biotechnology. The value of the MBR supply exceeded US \$10m.

During the late summer 1989, after completion of commissioning trials, it is planned to commence practical operation of the plant. Apart from fulfilling educational commitments, the Shemjakin In-

stitute will also carry out specific R&D activities for the biotechnology industry in the USSR and possibly take on mandates from other countries.

ICI'S BIGGEST INVESTMENT IN ASIA PACIFIC

Britain's chemicals manufacturing giant ICI has announced its biggest-ever single investment project in Asia Pacific, a £150 million pure terephthalic acid (PTA) plant to be built in north-west Taiwan.

Production from the 350,000 tonnes-per-annum plant, scheduled to come on stream in the third quarter of 1991, will not only supply the company's customers in Taiwan, but will also be exported to nearby markets. World demand for PTA, a key intermediate product in the manufacture of polyester fibre, polyester film and PET (polyethylene terephthalate) containers, has grown at 13 per cent in each of the past five years and according to ICI is forecast to maintain high growth during the 1990's. The company is the world's second largest PTA producer.

ICI director Chris Hampson said the decision to go ahead with the scheme demonstrated ICI's strategic commitment to growth in Asia Pacific. The Taiwanese PTA market is the largest in the world, reflecting Taiwan's increasing dominance of the region's polyester fibre industry.

The project forms part of ICI's strategy of participating more fully in high growth economies and markets in Asia Pacific, and underlines its long term commitment to the polyester intermediates business.

The company's interests in Asia Pacific, and particularly in the northern Pacific, have expanded rapidly in the past five years. Its recent investments in the area have included the planned doubling of methyl methacrylate (MMA) capacity at the Kaohsiung Monomer Company, ICI's 60/40 joint venture in Taiwan, to some 65,000 tonnes a year at a cost of £50m. This is due to come on stream in 1990.

In addition, ICI's operations in Japan have expanded rapidly over the past few years, with £100m spent on a Technical Centre and production facilities, while the company moved into manufacturing in South Korea for the first time last year with the acquisition of a majority shareholding in Woobang Chemicals.

A new speciality chemicals plant is about to start up in Thailand where the British company is also developing a PTA project in which it has a 40% share of a £130m investment. This plant is scheduled to be on stream by the end of 1992.

ICI is today one of the largest foreign investors in Taiwan, with nine different activities on the island, including trading, production of paints, polyurethanes and pharmaceuticals, and joint ventures in industrial explosives and the manufacture of MMA. (

OFFSHORE OIL: UK NORTH WEST APPROACHES STUDY

A contract to manage the organisation of environmental information for offshore oil activities has been awarded to Metocean Consultancy Ltd., UK, by the North West Approaches Group (NWAG),

made up of seven major international oil companies and Britain's Department of Energy.

The Haslemere, Southern England, based consultants are managing the collation and dissemination to NWAG members Amoco, BP, Elf, Esso, Phillips, Shell and Total of information essential in planning exploration drilling and designing production for specified areas in the North West Approaches to the British Isles, from the Hebrides to North of the Shetlands (56-62 deg N and 1-10 deg W).

The project covers winds, waves, currents visibility and the temperature of both air & sea water. The North West Approaches are environmentally complex and experience harsher weather conditions than the North Sea because

of their exposure to Atlantic storms. A full understanding of the meteorological and oceanographic regime is important for a wide range of operations including seismic exploration; anchoring, spudding-in and day-to-day operation of exploration drilling units; deployment of divers and support craft; planning construction work; and designing fixed and floating production facilities.

The seven NWAG oil companies have pooled their existing environmental data on the area. Metocean's task is to manage the organisation of all this data in addition to assessing and incorporating other information gathered by scientific establishments, government authorities and defence departments. Metocean will also organise and control the gathering of

new environmental information by data acquisition or by commissioning studies.

Of particular concern in parts of the North West Approaches are the complex patterns of currents at various depths. Water mass characteristics, wind patterns, the tracks of depressions and long Atlantic swells, which can seriously hamper some marine operations, are also being studied, in the second major contract awarded by NWAG to Metocean in the past four years.

(Metocean Consultancy Ltd., Hamilton House, Kings Road, Haslemere, Surrey GU27 2QA, England. Telephone 44-428 56925. Fax +44-428 61530).

CANADIAN POLYMER DUMPING ROW

The Canadian national revenue department is investigating a complaint of dumping in Canada of plastisol materials produced by Plost-O-Meric in Waukesha, Wisconsin. The complaint was made Sternson Co. of Brantford, Ontario, one of the three major producers of merchant plastisols. The others, BASF Canada and FH & Sons Mfg, declined to support Sternson's action.

Most of the dumped plastisol was for auto trim end use. Sternson dominates this market, in which the other two producers are not involved. The company estimates it had 45 per cent of the total market in Canada in 1988. However, its share dropped sharply towards the year end, when it lost a major contract.

The revenue department estimates that 95 per cent of plastisol imported into Canada in 1988 "may have" been dumped.

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Chemical Markets Abroad

INDUSTRIAL DISPUTE DISRUPTS BP

The threat of industrial action BP's Baglan Bay complex has disrupted plans to restart the strikers' plant, writes Martin Todd. Staff at Baglan Bay, belonging to the Transport and General Workers Union (TGWU) and the Amalgamated Engineering Union (AEEU), had intended to take industrial action from 27 July. The threat of a strike stopped work on commissioning the plant for the last part of a week. Last minute talks between management and the unions agreed a settlement, which ultimately meant that strike action was averted hours before the dispute was to commence. With recommissioning work due to begin immediately, it is expected the plant will be back on stream within the next two weeks.

The plant originally went down over the weekend of 8-9 July, after a fire in the onsite powerstation cut through a powercable, forcing the whole unit down. At the time BP expected a very quick resumption of production but this has been adjusted to cover a wide timespan.

BP had hoped to restart its 200,000 ton/year Baglan Bay cracker recently, but failed to meet its deadline, for technical reasons independent of industrial relations pressure. The potential strike action meant all work on the plant ceased for the main part of a working week. Those parts of the complex that had been brought back up, were turned off again, until the industrial dispute was resolved.

When the initial shutdown took place, BP declared force majeure

on VAM and isopropylalcohol; this looks set to continue. The company was also known to be short on other products including styrene, with its 220,000 ton/year plant down, and butadiene, with the 60,000 ton/year plant out. Ethylene proved no problem, as most ethylene produced at Baglan Bay is consumed internally, and the market was generally long.

Approximately two weeks ago, BP entered the market and obtained 6,000 ton of styrene through swap deals and from the spot markets, although the company is believed to be covered in the short-term.

BP is known to be in the market for butadiene. Unfortunately Europe's merchant market remains extremely tight, after a number of unscheduled shutdowns and industrial disputes disrupted supplies in quarter two. Prices have risen from \$270-\$280/ton fob NWE, two months ago, to stand at \$360-370/ton fob NWE now, with higher numbers up to \$390/ton fob NWE, being talked. Players say prompt material is virtually impossible to source and prices can expect to go up in the coming weeks.

Recently BP has placed enquiries for propylene for August delivery. Although the market is said to be balanced rather than tight, not many sellers are to be found. Prices for propylene on the spot market remain at DM 730-780/ton NWE.

Veba continues to have difficulties with its 600,000 ton/year ethylene cracker at Gelsenkirchen. The unit initially went down on 6 July. After several attempts to restart the cracker, which proved unsuccessful due to difficulties with the turbine, the company de-

cided to re-schedule its September shutdown. The cracker will now stay down for 5 weeks, until the planned maintenance has taken place.

Market watchers do not think Veba will have difficulties in covering its ethylene needs as the supply remains relatively long. However, supplies to the ARG pipeline have tightened, with the news of the prolonged Veba shutdown. Prices on the pipeline have firmed to DM1,030-1,100/ton FD, for prompt delivery.

Veba is known to have made enquiries for spot propylene recently. It is not clear whether the company was able to cover commitments.

U.S. OVERCAPACITY LOCMS FOR PE

The US polyethylene industry is assured of overcapacity if it continues to build new plants at its present rate, says Houston consultant Bonner and Moore. By adding an expected 2.9m ton of new capacity between 1988 and 1992, producers are heading for problems, according to the report.

Producers plan to add 1.4m ton of high density and 1.3m ton of linear low density polyethylene to capacities by 1992. Most of the new high density polyethylene units will have been designed to use swing technologies, allowing them to produce either high density or linear low density polyethylene.

Yearly average polyethylene output is expected to rise by 816,000 ton in 1989, rising to 1.08m ton by 1990 and falling back to 771,000 ton in 1991. All new plants are projected to be completed around scheduled announced dates. Operating rates can also be expected to drop as the new capacities begin to affect the market.

NNNNNNU

The US market has already softened somewhat this year, with falling away of export demand, especially to the Far East. Overall the US domestic economy has slowed, lessening demand.

STOLT-NIELSON SHOWS RISING Q2 PROFITS

Stolt Tankers and Terminals has reported substantial increases in operating profits for the second quarter and first six months of fiscal 1989.

Net operating revenues for the second quarter rose to \$127.1m, a 17 per cent increase over the same period in 1988. Net income from operations increased 83 per cent to \$15.2m. The company said a nonrecurring gain from an insurance settlement of \$5m, boosted net income during the quarter.

For the six month period, net income from operations more than doubled to \$28.3m on sales of \$246.7m. Revenue during the first half of 1988 was at \$209.7m. Meanwhile, net income for the first half of 1989 was \$33.3m, including the insurance settlement gain.

The company said during the quarter it increased its fleet through the acquisition of three stainless 12,700 dead-weight ton parcel tankers.

In a further move, the group has entered the regional chemical tanker market in Northern Europe through the acquisition of Interchem from Louis Dreyfus. The company claims this move has enabled it to establish a European market share with many of the major chemical companies it has already served through an inter-continental trade.

On land, phase one of the owners berth project in Houston was

commissioned and the expanded terminal is already operating close to full capacity.

The company said a strong performance in the parcel trade business reflects the continuation of the gradual improvement in the parcel tanker market, resulting from the current favourable supply and demand trend.

ISRAELI NAPHTHA PRICE ROW TO END

The Israeli naphtha price row is near to ending after a preliminary agreement between finance and energy ministries. A new price formula has been settled which links naphtha prices to fob Med plus three dollars. The solution is intended to be a stop gap until a complete review of the Israeli energy and fuel market is concluded.

The deal was agreed when Moshe Shahal, the minister of energy, agreed to the treasury's request to remove proposed levies from the domestic naphtha price. An interministerial committee has been established to work out details of the new naphtha price formula.

Industry sources in Israel are believed to favour the settlement, which "could lead to further expansion and investment in the chemical industry." If the solution is accepted by industry and government, no further court action will be necessary.

AMMONIA PRICES SLIDE IN SLACK WORLD MARKET

Ammonia prices continue to spiral downwards, with the rate of decrease appearing to pick up pace. Market observers have no clear theory on why numbers have fallen away so rapidly, although oversupply and lack of regio-

nal demand appear to have played a large part.

In Europe and the US, the planting season is long gone, with very little domestic demand. Expectations towards potential US demand earlier in the year were extremely high, especially in the light of last year's extreme drought. Projected usage in the US never really materialized. Both domestic producers and Caribbean countries, which import into the US, were left with surplus product, helping to weaken prices.

The slump in US prices throughout 1989 has been drastic. In quarter one ammonia prices stood at \$160-165/ton c&f Tampa, falling to \$105-110/ton c&f Tampa now. Currently, numbers of \$75-85/ton c&f Tampa are commonplace in the market, with players expecting further drops.

Falling US prices have devastated producers, and a number are considering cutting back on production. First Mississippi Co. has closed its 412,000 ton/year anhydrous ammonia plant until further notice. The company expects to do some routine maintenance work while the plant is down, but admits it has no plans to bring the unit back on stream. US inventories are approximately 18 per cent higher than at the same time last year.

The continuing dispute between Indian and Arab phosphoric acid producers has also hit ammonia prices hard. India traditionally buys quantities of Middle Eastern phosphoric acid and ammonia to produce diammonium phosphate (DAP). Earlier in the year the parties were unable to come to a price settlement for the annual quantities of phosphoric acid, leading India to cut back on ammonia imports.

India has concentrated its purchasing strategy towards buying DAP. The most recent purchase, believed to have taken place in the last two weeks, was for 170,000 ton of DAP, bought from Phoschem at \$165/ton fob US. Ironically, since DAP has become a primary target for India, prices have begun to fall away, reflecting the overall weakness in the fertilizer market.

In quarter two DAP stood at \$190-195/ton fob US, this has slipped some \$30-35/ton since then. Encouraging India to continue its DAP buying strategy, the Indian government has provided extra funds for the increase in DAP imports. However, domestic producers, who have been forced to cut back on production and close units, are lobbying for a reduction in imports.

Middle Eastern suppliers have played a major role in ammonia's crash. Producers in the region enjoy exceptionally cheap feedstock costs, making any turndown in capacities unlikely, even in the present long market. Ammonia from the Middle East, which normally would have gone to India, is being targeted at other countries, acting as a catalyst for lower worldwide prices.

Europe ammonia prices have suffered two major crashes in 1989. At the start of the year, prices stood at \$145/ton c&f Spain; in quarter two they slumped to \$125/ton c&f Spain. Now prices are down to \$98-102/ton c&f Spain. Kuwaiti producers are rumoured to have sold into Europe at \$97/ton c&f Spain, increasing expectations for lower numbers. The dip afflicting the European market reflects ammonia's overall weakness.

The Soviet Union continues to pursue an aggressive export poli-

cy. Market observers are unclear on why producers appear to have excess product. The effect of the mild winter, which increased the Soviet feedstock supply, has been discounted, as this has now worked its way through the market. A number of European contracts through quarter three and into the fourth quarter are believed to have been concluded by the Soviets at \$100-103 c&f.

Although way below expected volume levels, some Far East business has been concluded. Prices of \$113-115/ton c&f Far East have been quoted.

AROMATIC MARGINS DRIFT DOWNWARDS

Aromatics prices continue to drift downwards and, although there has been a slight upturn in the past two weeks, players say this is a "blip," and expect the overall trend to continue downwards, in the short term.

Oversupply and lack of demand continue to be a scourge in the market. Benzene has been hit by lack of downstream demand, while a weakening US market has adversely affected prices. A number of recent outages suffered by Wintershall, Veba and BP has led to some "speculative" pick-up in numbers, although this is not predicted to last.

Toluene has suffered from a lack of interest from gasoline blenders. It is obvious refiners in the US and Europe have adjusted their production runs, and the need for incremental octane additives is not going to be as great in 1989, as in the gasoline season last year.

In recent weeks, the sliding gasoline market has added to toluene's woes, further contributing to the drop in benzene. A month ago, 0.15 premium gasoline stood at

\$224/ton cif NWE. Since then it has fallen to \$185/ton cif NWE.

The relative failure of refineries to capitalize on the initial marketing success of premium grade gasoline has also added to the difficulties of aromatics, such as toluene and xylenes. When the gap between regular unleaded gasoline and premium unleaded gasoline became too large, up to 20 cents/gallon in the US, many consumers switched back to the cheaper regular unleaded gasoline. This has lowered demand for premium product and, in turn, gasoline additives, such as toluene and xylenes.

Paraxylene prices have remained relatively stable in past weeks, although renewed buying interest from the Far East has bolstered prices recently. Traders have shown reluctance to take long positions on paraxylene, after seeing prices soar and crash back twice in the first half of the year. Now India is back in the market with a recently concluded tender at \$635/ton cif Bombay, some life has been injected into the market. With a couple of Far Eastern PTA units due to startup in the second half of the year, players are tentatively speculating on rising prices.

Orthoxylene has weakened consistently throughout quarters two and three. At the beginning of the second quarter, spot orthoxylene prices stood at \$440/ton fob NWE, dropping at regular intervals to now stand at \$305-315/ton fob NWE. In the last week, interest from Far Eastern buyers has revived orthoxylene's fortunes. European downstream customers rarely enter the market and continue to obtain all their material through contract agreements.

Against a general trend, xylenes have shown more resilience to a falling market than other aromatics.

News About New Projects

OXYCHEM SIGNS DEAL FOR SOVIET PVC PLANTS

The US company Occidental Chemical Corp. (Oxychem) has signed a joint venture agreement with the Soviet Ministry of Chemical and Petrochemical Industry to construct and operate two polyvinyl chloride (PVC) plants in the Ukraine. The \$200m project was given the go-ahead on the basis of a feasibility study assessing the technical and economic benefits of the joint venture, which is to be called Arnica.

Construction of the plants, to be located at Kalush, will be carried out in two phases. The first involves the construction of a PVC resin facility with a capacity for 40,000 ton/year of PVC dispersion resins, using Oxychem's Hybrid technology. The resins are used in consumer products, such as sheet vinyl flooring, upholstery fabrics and moulded vinyl items. Work on the plant will begin in 1990, with completion scheduled for 1993.

The second facility will have a production capacity for 50,000 ton/year of PVC film, to be used in food packaging, wall coverings, pond and reservoir linings. Technology for the second facility will also be provided by Oxychem, the largest producer of PVC in the US.

Some 75 per cent of the output from the facilities will be sold in the Soviet Union and other Comecon countries, while the remainder will be earmarked by Oxychem in Western and other international markets.

The venture reflects Oxychem's commitment to the PVC business,

said J. Roger Hirl, president and chief operating officer of Oxychem. "We anticipate that markets for Arnica's products will grow steadily and rapidly over the ensuing years as the Soviet economy continues to develop."

FAR EAST FIRMS PLAN PX UNITS

General Petrochemical Industry is planning to build a Yen 14bn (\$100m) 150,000 ton/year paraxylene facility at Sakai in Japan. The unit will be one of many currently being planned to cope with the expected Japanese and Far Eastern demand. The unit, which will use UOP's Parex and isomer processes, will be built on the oil refinery site of its parent, General Sekiyu.

Due on-stream in September-October 1990, the facility will be supplied by General Sekiyu's oil refinery. The parent company has already brought on-stream production units for benzene (30,000 ton/year), toluene (120,000 ton/year) and xylene (150,000 ton/year).

General Petrochemical Industry will not be alone in bringing new paraxylene capacity to the marketplace. Tonen Sekiyukagaku is intending to debottleneck by around 50,000 ton/year volume at Arita, while Idemitsu intends to debottleneck its Tokuyama plant by 30,000 ton/year in October 1990, followed by a larger debottleneck of its Chiba unit in Q1 in 1991.

Next year will see another three Japanese paraxylene plants coming on-stream to feed current and future demand from Far Eastern pure terephthalic acid plants due on-stream over the next few years. Nippon Mining, Mitsubishi Oil

and Nippon Petrochemical are planning to bring in paraxylene capacity, although some existing units will be shut down concurrently.

Yukong will be bringing on-stream a 200,000 ton/year paraxylene unit at Ulsan, South Korea at the start of 1990 to feed Suni-yong's Ulsan-based 100,000 ton/year PTA and 160,000 ton/year DMT unit which is also due on-stream by November this year.

Honam Oil expects to bring on-stream a 200,000 ton/year paraxylene unit on-stream next summer in time to supply Sam Nam Petrochemical 250,000 ton/year PTA facility which will start up next April-May.

SCM EXPANDS TiO₂ CAPACITY

SCM Chemicals has unveiled plans to expand TiO₂ production at its Ashtabula, Ohio operation. The \$67.5m expansion will increase the capacity of SCM Chemicals' Ashtabula plant I by 58,500 to 107,000 ton/year using the firm's environmentally more acceptable chloride process.

Sir Gordon White, chairman of Hanson Industries, commented: "This expansion is in response to continuing strong world demand for TiO₂. It follows the successful completion and start up in January 1989 of SCM Chemicals' 77,000 ton/year chloride process facility at Bunbury, Western Australia and 18,000 t/y expansion of the company's Ashtabula plant II in July 1988."

Once the expansion is completed and started up (expected early 1991), SCM Chemicals will have a global production capacity exceeding 500,000 ton/year. White adds that the latest expansion underpins Hanson's strong commitment to the growth of internal businesses.

SITES SPECIALITY POLYOLS FACILITIES

ICI polyurethanes is to produce speciality polyols in the US for the first time and intends to increase its polyol blending operations. The firm has announced plans to build the speciality polyol production unit at Geismar, Louisiana and locate the blending operation next to its Sterling Heights, Michigan-based technical centre.

Locating polyols production and blending operations in the US reflects the firm's commitment to meeting key strategic commercial and development objectives, according to ICI Polyurethanes group president, Robin Gadsby. The firm imports speciality polyols from Rotterdam, in the Netherlands.

Gadsby revealed the new production will be used to take advantage of growing demand for polyurethane feedstocks, which is projected to increase 5 per cent/year globally. Both plants are expected to be fully operational by the first quarter of 1991.

The company refused to reveal the cost or the extent of the expansions, although a spokesman described the speciality polyols move as "significant new capacity to the US market." The Sterling Heights unit will have more than 10,000 ton/year blending capacity.

CERTAIN TEED TO REVAMP PVC PLANT

US PVC producer, CertainTeed, has unveiled plans to completely revamp its Lake Charles, Louisiana-based PVC facility. The company intends to replace five existing PVC reactors over the next 18 months. The new react-

ors will use Atochem's improved PVC process design.

The decisions to revamp the five reactors follows the commissioning, last March, of a sixth reactor, which raised the plant's capacity to 120,000 ton/year. Atochem will assist in process, engineering studies and construction.

MOBAY LINKS UP WITH FIRST CHEMICAL

Mobay Corp. and First Chemical are co-operating to build a 113,000 ton/year aniline plant at Mobay's Baytown, Texas facility. The facility will use First Chemical's technology, with completion slated for the first half of 1992. Details of the investment costs have not been revealed.

First Chemical will act as general contractor for plant construction and will market all aniline not used by the Bayer USA company. Mobay will be the owner/operator of the plant, which will also include nitric acid and nitrobenzene as precursor units, which will be expanded comparably.

NOVO JOINS SK&F IN CNS RESEARCH

Novo-Nordisk and SmithKline & French (SK & F) Laboratories have signed an agreement for the discovery, development and commercialization of calcium channel blockers, for the treatment of strokes, and drugs for central nervous system (CNS) disorders.

Under the agreement the companies will test and develop a novel class of compounds discovered by Novo-Nordisk's CNS Group.

Novo-Nordisk will exclusively market the compounds in Europe and SK & F will have exclusive marketing rights outside Europe.



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Biotechnology

WELLCOME GAINS US BOOST FOR AIDS AND INFANT DRUGS

UK-based Wellcome's US drugs operations have received a double boost as a result of satisfactory results in a trial of its anti-viral Aids drug **Retrovir** and the granting of Food & Drug Administration (FDA) approval of its investigatory new drug application for **Exosurf Pediatric**, to prevent respiratory distress syndrome in premature babies.

Wellcome's antiviral drug zidovudine (AZT), marketed as **Retrovir**, has been shown to delay the development of Aids or severe Aids-related complexes in patients infected by the HIV virus, according to a study by researchers at the US National Institutes of Health (NIH), in collaboration with Burroughs Wellcome.

Anthony S. Fauci, director of the National Institute of Allergy and Infectious Diseases, says, "For the first time, a study has clearly shown the benefits of early intervention." The main thrust of US Aids research has been to delay or prevent the development of Aids in those infected by the HIV virus.

An additional finding of the study is that less than 5 per cent of the patients treated with AZT suffered serious side effects, such as anaemia. This compares with around 40-40 per cent of patients who have developed Aids. This suggests the toxic effect of AZT on bone marrow poses less problems with patients treated at an earlier stage of the disease.

The study, coordinated by Miami University's Dr. Margaret Fischl, covered 713 Aids patients exhibiting mild symptoms, including rashes, diarrhoea and oral

thrush. All had moderately suppressed immune system or T-4 cells in the range 200-800 cells/cubic millimetre.

AZT was given to half the group on a basis of 200 milligrams every four hours over a period of 3 to 20 months, while the control group received a placebo. In the AZT group 14 patients developed Aids, or Aids related complexes, compared with 36 in the control group. The patients which benefit the most have T-4 cell counts in the region of 200-500. The researchers say that all patients in the control group are now receiving AZT.

According to Dr. Fauci, 95-210,000 of US Aids-infected patients fall within the study's definition of who might benefit from early treatment. However, the price of **Retrovir**, at around \$8,000/year/patient, is expected to complicate large scale testing and treatment.

Another AZT trial, which will be completed shortly, involves patients confirmed as HIV-positive but free from symptoms.

Wellcome's research director has been reported as saying the US study confirms the company's optimism about AZTs but a full evaluation of all the data will be required before any application is made for product licences in the US, Europe and Australia. This is expected to take some months. Around 31 per cent of Wellcome's \$262m year R&D budget is spent on infectious diseases, in the main Aids and herpes.

Sales of **Retrovir** are reported to have quadrupled in 1988 to \$147.4m, and have been estimated at \$210-230m for the year ending this month. This growth is expected to continue reaching

\$250m in 1990, and possibly as high as \$460m in 1992, according to some analysts. Wellcome is expected to gain FDA approval for its wider use.

Burroughs-Wellcome has joined forces with Vical, the San Diego, California, based biotech firm, to look at improving AZT's action by blending it with lipids and phosphates. This modification is believed to enhance the drug's ability to penetrate the macrophage or 'scavenger' cells which have been infected by the HIV-virus.

Vical's president, Wick Goodspeed, is reported to have said the modified AZT products may be available for human clinical trials before the end of 1990.

Meanwhile, the granting of FDA approval for **Exosurf Pediatric**, means the drug will now be available for supervised use in around 600 US hospitals.

AKZO PICKS XENOVA

Xenova, the UK pharmaceuticals R&D company, has secured a collaboration deal with Dutch chemicals major, Akzo. The two firms plan to work together developing novel inhibitors of the enzyme thrombin, which could be developed as cardiovascular drugs.

Under the terms of the deal, Akzo's Organon will transfer its existing assay technology to the UK outfit for screen development. Xenova will screen its microorganism collection for potential inhibitor producers and isolate, purify and characterize any such compounds.

Organon will be responsible for the evaluation of any leads, as well as the pharmaceutical and clinical development of any new drugs the programme yields. The deal is Xenova's first collaboration with an EC-based company.

Environment

GULF STATES AGREE ENVIRONMENT PLAN

A regional action plan, including provision for pollution control and health and environmental impact assessments for future development projects in the area, has just been launched by the Gulf states under the auspices of the United Nations Regional Seas Programme.

The entire programme will be centred on a new chemical database with a direct link to the region's leading technological and scientific research and training institutions. The programme is planned in conjunction with a broad series of training schemes to create a dependable local pool of knowledge related to the recycling and disposal of chemical wastes, as well as coastal resource management.

Europe's chemical industries are backing the project under global arrangements administered by specialist UN agencies concerned with environment protection. Industrial development and public health planning.

Specialists from Iran, Iraq, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates launched the project, the Kuwait Action Plan, at an extraordinary meeting of the Council of the Regional Organization for the Protection of the Marine Environment, held in Kuwait.

The Kuwait Action Plan was originally launched in 1978 and was the second such plan after that covering the Mediterranean. It is one of the collaborative pollu-

tion control agreements binding countries grouped by different regional seas. Each action plan seeks to coordinate regional development to bring the needs of industry in line with those of nature.

Related schemes are advancing for the coastal regions of East, West and Central Africa, the Red Sea and the Gulf of Aden, South-east Asia, the South-east and the South-west Pacific, the Wider Caribbean and the South-west Atlantic region of Latin America.

MAJOR USERS AGREE ON CFC REDUCTIONS

Four major companies have agreed to reduce or eliminate their use of chlorofluorocarbons (CFCs), which are widely used as refrigerants and as cleaning agents in manufacturing.

General Motors Corp said it will require its dealers to install CFC recycling systems by the autumn of 1990 for the 1991-model year. Meanwhile, Japan's Nissan Motor Co. claims that by 1993 its car air conditioners and manufacturing processes will be completely free of CFC's.

General Electric Co. of the US, which is currently releasing CFCs into the atmosphere because of a major refrigerator-compressor replacement programme, pledged to find other ways to offset that amount by other unspecified reductions.

Finally, American Telephone & Telegraph Co. said it plans to eliminate CFCs from all its manufacturing processes by 1994. The company's new CFC-elimination

policy also calls for the company to curb its 1986 CFC usage to 50 per cent by 1991.

These plans are in line with requirements by the Montreal Protocol, an agreement signed by 40 nations to stop the erosion of the ozone layer.

MIXED FORTUNES FOR ETHYL CORP

US Chemical company Ethyl Corp, has reported net income for the second quarter of 1989 at \$57.56m, up from \$56.89m for the 1988 quarter.

For the first six months of 1989, Ethyl's net income was \$113.9m, up from \$109.9m in 1988.

Total net sales for the second quarter of 1989 were ahead 18 per cent to \$767.22m from the year earlier period. For the six month period, sales increased 15 per cent to \$1.49bn.

Following the close of the second quarter, Ethyl completed the spin-off of its aluminium, plastics and energy businesses into a new publicly owned company, Tredegar Industries.

Chairman, Floyd D Gottwald said chemicals improved due to good performances by the petroleum additives and special chemicals divisions. There was, however, a decline in the industrial chemicals sector.

Commenting on the overall performance the company said second quarter net income reflects lower realized gains by the First Colony Life insurance company, coupled with a \$2.5m after-tax charge to cover the scheduled shutdown of facilities in the electronic material division.

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New Developments from Japan

AJINOMOTO SUCCESSFUL IN MASS-PRODUCING DDA

Ajinomoto Co. has recently successfully developed the technology for mass-producing di-deoxyadenosine (DDA), a drug expected to be an effective treatment against AIDS. The new process combines chemical synthesis and enzymatic reactions, which helps to reduce the production costs considerably. DDA production was previously a lengthy process and mass production was thought to be out of question. Ajinomoto's development is the first technological breakthrough of this kind in the world.

The same process can also be easily used to produce di-deoxyinosine (DDI), a compound similar to DDA. Ajinomoto intends to supply the product to Bristol Myers, their affiliated company in the U.S.A. Decisive progress is anticipated in U.S. clinical tests, leading to an early application for the drug's official registration.

CERAMIC GAS FILTER CAPABLE OF TRAPPING ALL FINE PARTICLES

Nihon Cement Co. is stepping up its ceramic gas-filter operations by supplying the device in sample form to industrial gas makers as well as semiconductor manufacturers. The company has approached almost all Japanese semiconductor makers and has obtained a high reputation for the device from some of them. In addition, it plans to thrust deeply into the industrial-gas industry. It hopes to start supplying the device in the middle of this year to industrial gas makers on a commercial basis; the makers concerned are now assessing the performance of the device.

The company has developed the filter in an effort to meet the semiconductor industry's demand for clean gas for use in the production of high-density IC

chips. The filter is produced from porous aluminum ceramics and is capable of trapping all the fine particles (size: over 0.01 micron) contained in gas: it has strong heat/pressure resistance and excellent degassing properties.

Conventional gas filters are usually produced from "Teflon" tetrafluoroethylene fluorocarbon polymers. They can stand temperatures of up to 150°C while corresponding temperature for Nihon Cement's filter is 200°C. The latter can also withstand pressure of up to 175kg/cm², much higher than in the case of conventional products. Its components have such a high degree of rigidity that its trapping capability for fine particles is not affected by any drastic change in pressure.

TSUMURA PUSHING RESEARCH ON USEFUL SUBSTANCES FROM PLANT

Tsumura & Co. is pushing forward with research on production of useful alkaloids from the hair roots of a plant, together with a research laboratory at Tsukuba belonging to the Ministry of Health and Welfare. One of the target substances is lobeline - a chemical having a significant effect on the respiratory function of man. The joint research has brought the finding that the hair roots produced by an agrobacterium rhizogenes-infected plant — Campanulaceas — produce lobeline and other alkaloids.

Tsumura and the Government labs are conducting joint research and tests to seek the optimum conditions for production of the target substances through cultivation of the hair roots. Plants infected with agrobacterium rhizogenes are induced to produce hair roots in which various alkaloids and amino-acid derivatives are produced. R & D on and application of this mechanism have been under way in recent years to obtain useful bioactive substances, and Tsu-

mura is intent on strengthening its commitment to this field in an effort to promote development of new drug ingredients.

CERAMIC THERMOMETER MEASURING HIGH TEMPERATURES DEVELOPED

Nippon Steel Corp. and Asahi Glass Co. have jointly developed a unique high temperature-use thermometer using zirconium boride, a kind of advanced ceramic. The thermometer can measure high temperatures continuously for a long time — those for instance of molten pig iron and steel. It is essential to measure the temperatures of molten iron and steel for iron-and-steel manufacture but conventional thermometers measuring such high temperatures are melted in 1-3 seconds in the molten metals. This is quite inconvenient and thus development efforts have been made for better thermometers, but without success.

The two companies, after joint research and tests conducted over about one year, have succeeded in producing a thermometer that can measure temperatures of up to 1,600°C continuously for 40 hours on average. It will soon be marketed here for Y150,000 (Standard type). Their annual sales target is set at Y500-1,000 million for the time being. The thermometer comes in the form of a zirconium-boride pipe with an outer diameter of 25mm and wall thickness of 5mm, in which a platinum-rhodium thermocouple is mounted. It can measure up to 1,600°C with a measuring accuracy of $\pm 2^\circ\text{C}$ compared with that of conventional disposable-type devices. Its speed of response is within 2.5 minutes for a temperature change of between 1, and 1,550°C.

UNITIKA UNVEILS NEW RESIN FOR SEPARATING HIGH-PURITY RARE EARTH ELEMENTS

Unitika Ltd. has developed a phenol-based ion-exchange resin for

use in separating rare earth elements. By applying ion-exchange chromatography using EDTA complexing agent, as a developer, separation of rare elements with a 99.999999% degree of purity can be obtained. At present, separation of rare earths is generally carried out using a solvent extraction technique. Although this method is geared toward large-lot production, a high degree of purity is difficult to obtain. Unitika has combined the two methods into what appears to be a simple method for extracting high-purity products. The company has recently begun shipping samples of its work to respected rare earth producers both in Japan and overseas, including Rhone-Poulenc.

The ion-exchange resin formulated by Unitika has been named "Uniselec UR." The company is the recognized market leader in phenol-based chelate resins (used to collect heavy or rare metals), and recently has extended their applicability to the rare earth separation field.

Unitika's separation and refinement process uses an ion-exchange chromatography technique that causes adsorption of a rare-earth mixed solution by the new ion-exchange resin. The adsorbed rare earth element is then liquidated with the EDTA complexing agent and the simple substance is separated as a water soluble liquid. The difference in affinity between the ion-exchange resin is used to separate the rare earth element.

Separation of rare earths using ion-exchange resins had been previously accomplished to a certain extent by using styrene based ion-exchange resins. Although styrene types offer large exchange capacity, elution time is lengthy and separation efficiency is poor. Another problem is that excessive amounts of EDTA are needed. According to a Unitika spokesman, the company's phenol formalin-type resin has a small exchange capacity, resulting in low adsorption strength, but offers high

separation efficiency and shorter elution time. Other merits include low EDTA usage and no requirement for holding-agent ions.

Currently, almost all rare earth producers are employing the solvent extraction method to separate rare earth elements. Using this method alone, however, will not satisfy requirements for higher degrees of purity nor offer flexibility in altering the composition of raw materials. In contrast, Unitika is combining existing solvent extraction methods with the ion-exchange method used by the resin to separate simple rare earth substances with a high degree of purity.

SHAPE-MEMORY ALLOY APPLIED TO ROCK CRACKING

Assistant Professor K. Kaneko of College of Engineering of Kumamoto University and his colleagues, together with Nishimatsu Construction Co. and Tokin Corp., have succeeded in utilizing a shape-memory alloy - Tokin's nickel/titanium alloy - as a rock/stone cracker. The three parties are scheduled to start marketing the new product during the next fiscal year.

Shape-memory alloy is deformed at low temperature and recovers its original shape at high temperature. The researchers have successfully cracked rocks by making the most of the alloy's restoration capability. They cut a hole in a rock and put three cylinders (diameter: 40 mm; length: 60mm) of the nickel/titanium alloy therein: the temperature at which the alloy recovered its original shape was set at 50°C. Cracks were produced in the sample rock after the cylinders were heated for two minutes: both plate and cord heaters can be used.

They could also crack a piece of granite, the hardest rock, using similar cylinders. The alloy will serve as a static cracking medium for concrete and rocks in the case of urban renewal. Compared

with a conventional hydraulic jack, it calls for a far smaller number of pieces of related equipment and saves on time and labour. Less time is required for cracking rocks than in the case of expansive cement.

MATSUSHITA DEVELOPS ZINC OXIDE WHISKER

Matsushita Industrial Equipment Co. (Head Office: Toyonaka City, Osaka Prefecture) - one of the companies of the Matsushita group - has developed a zinc-oxide whisker, which is expected to have a wide range of uses centered on reinforcement material for metals, resins and ceramics, and it has become possible to mass-produce the whisker. The company is therefore to start sample deliveries in May.

Only silicon-carbide and potassium titanate whiskers are currently in practical use. They are, however acicular. The zinc-oxide whisker developed by Matsushita is tetrapod shaped. Fiber in lengths from 2 to 300 micron can be manufactured freely. The company has an experimental furnace with a capacity of 10 tons a month at its Toyonaka factory and has embarked on use cultivation. The zinc oxide in question is said to be supplied at a lower price than that of potassium titanate.

SHIKIBO MASS-PRODUCES HUMAN PROLACTIN USING GENETIC RECOMBINATION

Shikibo Ltd., with the cooperation of Dr. K. Nakajima of Mie University's Medical Faculty, has achieved the world's first mass production of human prolactin - a lactation hormone - , utilising genetic recombination. The company will first commercialize the substance as a reagent to be used in research.

About 100 biological activating effects have been documented for prolactin, including promotion of growth of mammary gland and maintenance of

pregnancy. On the clinical side, a number of applications are anticipated in treating prolactin deficiency, infertility, and lactation deficiency. Although natural prolactin has been used in the past, its high cost, insufficient usable volume, and hormone impurities have been problematic. Shikibo's new technology, however, can provide a stable supply of high purity prolactin, and has opened the door to a more comprehensive understanding of the substance's biological activating effects in humans.

The method established by the Shikibo group uses *E. coli* as a host and plasmid PUC-19 that effects mass production of human prolactin through direct manifestation of cDNA. In this method, (1) the prolactin whose amino acid sequence is the same as that of natural one is directly produced through cDNA of *E. coli* as a result of the careful examination and modification of the DNA base sequence in question; and (2) the prolactin which is insoluble and inactive in *E. coli* is made soluble and active. The methods are said to allow production of about 400 milligrams of high-purity human prolactin per liter of *E. coli* culture solution.

ZIRCONIA-BASED FAR INFRARED RADIATION-EMITTING PAINT USED FOR HEATERS

Asahi Glass Co. has developed zirconia based far infrared radiation emitting paint and technology for coating the new product on quartz pipes. The paint consists of zirconia powder (particle size: a few microns) and glass based binders. There is no large gap in coefficient of thermal expansion between the product and the quartz pipes. Coating film produced from the product itself neither cracks nor peels off the pipes—shortcomings seen for conventional far infrared radiation-emitting paint.

The paint is coated on targeted pipes using a printing machine: any type of pattern can be formed on them. It is cap-

able of enduring heat of as high as 700-800°C. It forms tough, stabilized coating film on quartz pipes and emits far infrared radiation having a comparatively longer wavelength.

The company has started supplying quartz pipes coated with the new paint for use as heating sources for toaster ovens, Japanese-style food warmers and electric stoves. In a related development, the company has also developed another type of far infrared radiation-emitting paint produced from nonzirconia oxide ceramics: the product has strong resistance against oxidation and corrosion. It will be commercialised in the form of heating sources.

U.S. REAGENT FOR VIRUS HEPATITIS WILL UNDERGO CLINICAL TESTING

Ortho Diagnostic System K.K., a wholly owned subsidiary in Japan of Johnson & Johnson International (U.S.), has asked the Ministry of Health and Welfare and the Japanese Red Cross Society to undertake clinical testing of a diagnostic reagent for virus hepatitis non-A, non-B to be introduced from Chiron of the U.S. The requirement may be accepted by the Japanese authorities in view of the significance of this task.

There are three types of virus hepatitis - hepatitis A, B and non-A, non-B. While the pathogenic viruses of the former two have been identified, that for the latter type has not, and thus it has been impossible to diagnose the disease as well as prevent infection caused by blood transfusion.

Chiron, however has identified the virus for hepatitis non-A, non-B in cooperation with a group of Japanese researchers, and has also succeeded in developing a clinical reagent for the disease. Ortho Diagnostic has agreed with Chiron to import its reagent to Japan. Chiron has been provided with research & development funds by Johnson & Johnson.

In Japan, about 16% of the patients given transfusions are said to be afflicted with hepatitis non-A, non-B with the number of such patients reaching more than 2 million. Chiron has been successful in producing an antigen protein for the virus gene presumed to be that of hepatitis non-A, non-B, and a group of Japanese researchers have identified it as being hepatitis non-A, non-B.

D-MANNOSE TO BE PRODUCED AT RATE OF 1-2 T/M

Towa Chemical Industry Co. is scheduled to start commercial production of D-mannose at a comparatively high rate of one to two tons a month. To this end, the company recently completed production facilities in Shizuoka Prefecture and developed new production technology designed to utilize glucose as starting material.

It claims that the new process ensures a steady supply of high quality products at lower cost. To date D-mannose has been produced in Japan from Konjak-jelly powder or ivory palm in amounts measured in kilograms for use in reagent production. Behind the planned commercialization of D-mannose is the fact that the company has agreed to supply the product to a U.S. maker of culture media. Uses for the product will probably be found in serum-free media, fermentation media and pharmaceuticals as well as reagents.

The Japanese company plans to push forward sales campaigns aimed at U.S. and European makers of drugs, culture media and reagents and supply the product to domestic universities and drug makers in sample form.

With regard to new application of D-mannose, MITI's Agency of Industrial Science and Technology has succeeded in developing mass-culture technology for cells to produce leucocytes and lymphocytes and in increasing their production capacity for antibodies.

JAPAN-U.S. VENTURE MARKETS NEW MATERIALS FOR TOOTH REPAIR

3M Health Care Ltd., a Japan joint venture of Sumitomo 3M Ltd., and Minnesota Mining and Manufacturing Co. (U.S.), has introduced a new series of tooth repair-use materials having high abrasion resistance and a good appearance matching Japanese teeth. The materials are made of a specially prepared resin with which ultrafine particles of silicon compound are mixed. They are used for filling a cavity in a tooth, giving a final appearance resembling that of natural teeth.

Traditionally in Japan, cavities in teeth resulting from decay have been filled using gold or silver alloys in most cases but the Japanese dislike using them as they feel the metallic appearance gives a bad impression. The company has set their sales target for the initial year at Y1,500 million.

ASAHI GLASS TO TRIPLE FLUORINE RESIN FOR PAINTS TO 4,500 T/Y

Asahi Glass Co. is tripling capacity for its "Lumiflon" clear fluorinated varnish to 4,500 t/y. Construction for the additional capacity is now underway at its Chiba factory.

Because of their excellent weather-proofness, demand for fluorinated resin paints has been rising rapidly in Japan for use on buildings, large structures and automobiles, and this is pushing up Lumiflon demand.

Lumiflon is the fluorinated resin used in the solvent-soluble paints Asahi Glass developed for the first time in the world. Development of these paints resulted from its success in tackling the problem that a fluorinated resin made soluble to solvents is liable to lose its distinguished properties as a paint resin, while the resin retaining its particular properties is difficult to dissolve.

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MARKET INFORMATION

Market Steady: Low Activity Level

On account of the festival season and the bandh trading activities, remained low. Except for bromine which went up by Rs. 8 to Rs. 78 per

kg, the market remained steady.

Polyethylene glycol remained very tight in supply.

We cannot guarantee the accuracy of the prices published in **CHEMICAL WEEKLY** as they are based only on the enquiries made by our correspondent – and, as such they are not **FIRM PRICES** as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on August 31, 1989)

DUSTRIAL CHEMICALS		Per Kg.				
			Borax (Granular)	15.00	Cobalt oxide	280.00
			Borax (Powder)	15.25	Cresylic acid	52.00
			Boric acid (Tech)	28.00	Camphor (Indian)	105.00
Ammonium sulphate	2.50		Bisphenol-A	82.00	Cream of Tartar (Tech.) China	70.00
Ammonium phosphate (Mono)	14.50		Butyl carbitol	110.00	Citric acid (Belgium) (Resale)	47.00
Ammonium phosphate (Di)	14.00		Caustic soda (Flakes)	14.00	Citric acid (Indian) (Resale)	47.00
Ammonium carbonate (Di)	17.00		Caustic soda (Solid)	12.00	Copper sulphate	24.00
Ammonium bicarbonate	5.60		Caustic soda (Lye)	10.00	Chromic acid	61.00
Ammonium chloride	3.00		Calcium chloride 70% (Solid)	3.25	Ethylene urea	58.00
Ammonium nitrate	6.00		Calcium chloride 75-80%(fused)	3.50	Ferric chloride (Lumps)	5.50
Barium white powder	24.00		Calcium chloride 36%		Ferric chloride (Anhydrous)	16.00
Carbamide (Resale)	100.00		(Anhydrous)	5.00	Glue flakes	15.00
Barium carbonate	6.00		Calcium carbonate (precipitated)	4.25	Glue sheets	6.75
Bleaching powder (33% Cl)	4.20		Calcium carbonate (Activated)	4.75	Gohsenol GH-17	115.00
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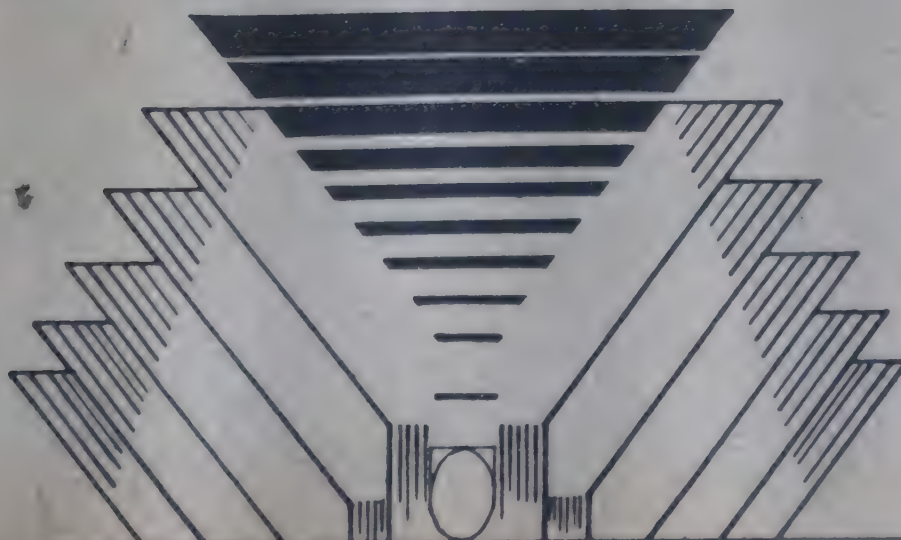
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Blue B. Base (Local)	255.00
Beta Naphthol (Atul)	75.00
Benzidine Dihydrochloride (BDH)	98.00
Bromamine Acid	600.00
BON Acid	130+Ex+Ta
Chicago Acid IRS	330.00
Coach Acid	55.00
C. Acid (Imp.)	165.00
Cyanuric Chloride	137.00
2,4- DNCB	31.00
Dihydrothio PTOS (Imp.)	1,000.00
Dimethyl Aniline	70.00
Diethyl Aniline	185.00
Diamino stilbene	
disulphonic acid	160.00
3,3-DCB (Imp.)	175.00
Gamma Acid (Atul)	200.00
H. Acid (Atul)	110.00
G. Salt	75.00
Isophthalic Acid	45.00
J. Acid	365.00
J. Acid Urea	400.00
K. Acid	127.00
MPDS (German)	190.00

MNA	140.00
Meta Ureido Aniline	235.00
MPD (Local)	215.00
MPD (Japan)	250.00
Naphthenic Acid	40.00
N-Methyl J. Acid	540.00
N-Methyl Aniline	130.00
Naphthalene (Refined)	21.00
Ortho Anisidine (OA) (Imp.)	105.00
Ortho Dichloro Benzene (ODCB)	16.00
OT Base	117.00
Para Dichloro Benzene (PDCB)	27.00
Para Anisidine (PA local)	150.00
PNA	100.00
Para Cresidine (Imp.)	400.00
Para Amino Azo Benzene (India)	190.00
PNCB	53.00
Para Amino Acetanilide	170.00
1-Phenyl 3-Methyl	
5-Pyrazolone	150.00
Phenyl J. Acid	375.00
Para Amino Benzoic Acid	135.00
PT Base	158.00
Rhoduline Acid	530.00
Resist Salt 80%	34.00
Resorcinol	190.00
Sodium Naphthionate	67.00
5-Sulpho-Anthranilic Acid	82.00
Sulphanilic Acid	52.00
Sulpho Tobias Acid	165.00
Trichloro Benzene (TCB)	22.00
Tobias Acid	165.00
Metanilic Acid	48.00
MTD	114.00

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RED OXIDE
LIME STONE
CHINA CLAY
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T. No. 6732666

Office:

212/5, Jawahar Nagar,
Saraswati Bhuvan, 2nd Floor,
Road No. 14, Goregaon (West),
BOMBAY - 400 062
T. No. 6722179

(Prices as on August 31, 1989)

ACID COLOURS		Per Kg.
Acid Violet 4BS		*190.00
Acid Maroon V		110.00
Acid Orange II		112.55
Acid Orange IIV		93.85
Acid Red A		137.00
Acid Scarlet 3R		128.35
Acid Red 3BN		*195.00
Acid Red R2R		132.00
Acid Red RS		88.00
Acid Patent Blue AS		*280.00
Acid Green V		*375.00
Acid Coomasi Blue		200.00
Acid Yellow 5GN		65.00
Acid Red PG		85.00
Acid Red GRS		78.00
Acid Black 10 BX		157.15
Acid Black BX		126.95
Acid Black Wax		135.50
Crsein Scarlet MOO		200.30
Procinil Yellow GS (ICI, UK)		265.00
Procinil Red GS (ICI, UK)		530.00
Procinil Blue RS (ICI, UK)		315.00
Procinil Scarlet G (ICI, UK)		600.00
Procinil Orange G (ICI, UK)		250.00
Procinil Rubine (ICI, UK)		550.00
* To get resale price add 6% tax.		
DIRECT COLOURS		Per Kg.
Yellow 3GX		114.00
Gun Yellow RCH		175.85
Fast Yellow GCH		171.50
Yellow CFG Hly. Conc.		721.00
Fast Yellow GS		126.96
Fast Yellow CHRS		116.85
Viscose Orange A		210.35
Fast Orange GR		171.50
Red		122.65
Dark Tan		98.15
Red IIR		98.15
Red 4B		217.55
Bordeaux BW		170.10
Fast Scarlet 4BS		223.50
Red 12B		220.45
Bordeaux Hly. Conc.		249.20
Cotton Red N		117.05
Brill. Fast Helio B		362.85
Brill. Fast Helio 2R		385.85
Brill. Fast Helio 2RS		177.30
Brill. Fast Helio BS		116.10
Brill. Violet Extra		181.45
Blue 2B		102.50
Blue G		220.45
Sky Blue FB		242.00
Copper Blue GR		190.25
Fast Greenish Blue GL		114.60
Developed Black BT		149.95
Blue NB-2B		348.45
Blue NB-2BG		214.70
Developed Black NB-GHB		214.70
Green B		142.75
Green NB-B		218.90
Green 2B-N		218.90
Brown MR		197.40
Brown CN		137.00
Golden Brown G		175.85
Catechin G		155.70
Omega Tan		161.45
Catechin GS		102.80
Black E Hly. Conc.		180.15
Black E Extra Hly. Conc.		180.15
Black NB-ER Hly. Conc.		290.50
DISPERSOL COLOURS		Per Kg.
Red B 3B Conc		611.50
Red B 2B Conc		797.90
Red CB Powder		1048.25
Red D2B Powder		589.85
Violet C 4R Conc.		1202.70
Blue BG Conc		580.65
Blue BN Powder		128.20
Blue D 2R Powder		588.25
Navy BT Conc		531.95
Blue B 2G Conc		577.95
Black BT Conc		319.50
Blue BR		482.40
Yellow 7GL		813.20
Yellow 5RX		269.90
Yellow 3G		473.20
Yellow		140.00
Yellow AL		167.20
Yellow Brown REL		311.70
Yellow FFL		571.40
Gold Yellow GG		320.80
Pink REL		593.00
Red BEL		615.60
Red 2B		422.40
Red FB		425.80
Red Violet FBL		622.00
Orange 3R		254.20
Violet 3R		370.50
Violet RL		355.70
Violet 6R		638.20
Scarlet RR		283.50
Rubine 3B		289.10
Rubine CB		449.50
Blue GL		419.00
Blue BGF		805.80
Navy Blue RE		359.90
Brown 3REL		272.80
Black GEL		420.10
Dark Brown 3B		411.10
BASE COLOURS		Per Kg.
Fast Yellow GC		77.75
Fast Orange GC		128.40
Fast Scarlet R		198.05
Fast Scarlet RC		128.40
Fast Scarlet RCR		105.60
Fast Scarlet G		115.75
Fast Scarlet GN		92.95
Fast Scarlet GG		77.75
Fast Scarlet GGS		73.95

ASTR	369.00	Blue H-FRD	305.80	Brill. Purple 2R Hly Conc.	744.25
ASPH	336.05	Navy Blue H3R	333.75	Brill. Purple 4R Supra Disp.	604.25
ASE	236.00	Blue H 5RX	286.20	Brill. Purple 2R Acra Conc.	779.85
ASEL	249.95	Navy Blue M3R	355.70	Blue 2R Powder Fine	675.30
ASLB	2002.35	Brill. Blue MR	405.60	Blue BC Acra Con Pdr. Fine	1013.15
ASBT	2459.45	Brill. Blue M RX	214.20	Blue BC Conc. Pdr. Fine	713.65
ASWG	143.00	Brill. Blue M-G	226.45	Blue R Conc. Pdr. Fine	719.70
ASSG	538.65	Blue M 4GD	369.40	Blue Conc. Powder	645.80
ASSR	652.60	Navy Blue M RB	341.85	Brill. Blue 2R Hly. Conc.	378.55
		Turquoise M-G	240.30	Blue RR Supra Powder	629.35
		Brill. Blue M GX	516.25	Brill. Blue 2R Supra Disp.	115.65
PROCION COLOURS	Per Kg.	Blue 3R Acra Powder	718.20	Dark Blue 2R Powder Fine	512.65
		Dark Brown H 6R	248.45	Blue BC Supra Disp.	419.65
Golden Yellow HR	207.95	Cobalt Oxide	285.00	Jade Green XBN Powder Fine	555.80
Brill. Yellow H4G	145.65	Green H4BD	287.00	Jade Green XBN Acra	
Supra Yellow H-8GP	168.55	Green H-E4BI	169.80	Conc. Pdr	1026.05
Brill. Yellow HE6G	214.75	Red Brown H IF	143.25	Jade Green 2G Pdr. Fine	533.25
Yellow G-E4R	276.05	Orange Brown H 28	209.05	Jade Green 2G Ptg. Paste	125.40
Brill. Yellow H7G	332.30	Brown M GRN	188.80	Jade Green XBN Ptg. Paste	126.00
Yellow M4R	275.45	Black H-N	314.20	Jade Green 2G Supra Disp.	618.00
Yellow MGR	387.65			Olive D Pdr. Fine	563.90
Brill. Yellow M4G	201.15			Olive Green B Supra Disp.	421.70
Brill. Yellow M8G	366.10	SULPHUR COLOURS	Per Kg.	Jade Green XBN Supra Disp. (N)	327.30
Yellow M3R	244.70			Olive OMW Powder Fine	698.55
Brill. Orange H2R	303.80	Navy Blue	210.35	Olive OMW Supra Disp.	538.05
Brill. Red H7B	157.95	Green G	194.55	Olive D Supra Disp.	361.70
Brill. Orange M2R	313.15	Black Grains Extra	72.25	Olive R Supra Disp.	470.25
Brill. Red H8B	213.55	Black Grains OG	73.70	Olive D. Ptg. Paste	193.00
Brill. Scarlet H RN	245.05	Black GXE Conc.	70.85	Olive Green B Ptg. Paste	199.10
Supra Red H-3BP	179.80	Black GXE	57.90	Olive Green B Acra Conc.	741.10
Brill. Red H-F3B	243.45	Black GXR	69.40	Olive R Acra Conc.	779.85
Brill. Magenta HB	182.00	Black Grains 800	62.80	Brown R Pdr. Fine	869.45
Brill. Red M 5B	160.05	Black EXR Grains	73.70	Dark Brown 3R Fine	826.25
Brill. Red M 8B	218.35	Black EXR Grains 800	59.35	Brown G Supra Disp.	582.05
Brill. Pink MB	137.10			Brown 2G Supra Disp.	716.10
Brill. Magenta MB	163.65			Brown R Supra Disp.	547.35
Brill. Purple H-3R	219.55	VAT COLOURS (ICI)	Per Kg.	Brown BR Powder	867.75
Brill. Purple H-7R	175.40			Dark Brown 3R Ptg. Paste	217.15
Navy Blue H 3R	333.75	Yellow 5G Supra Disperse	561.85	Dark Brown 3R Supra Disp.	529.60
Brill. Blue H-GR	406.40	Yellow 5G Acra Conc	818.60	Brown G Acra Conc.	967.95
Brill. Blue H5G	207.95	Gold Orange 3G Pdr. Fine	1158.45	Brown M. Powder Fine	768.80
Blue H 5RX	286.20	Brill. Orange 6R Pdr. Fine	624.35	Grey M. Supra Disp.	585.45
Brill. Blue H 7G	213.95	Gold Orange 3G Supra Disp	693.85	Blue BC Acra Conc. Pdr. Fine	762.70
Brill. Blue H 7RX	358.15	Brill. Orange 6RX Powder	394.30	Direct Black AC Supra Disp.	415.75
Turquoise HA	265.05	Brill. Red 3B Pdr. Fine	1214.15	Direct Black AC Pdr. Fine	574.70
Supra Blue H-3RP	595.30	Brill. Red 3B Supra Disp	867.45	Direct Black CH Supra Disp.	490.45
Supra Turquoise H 2G P	181.50	Brill. Purple 3R Acra Powder	827.05	Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: AUGUST 25, (NNS)

Rangolite Germany jumped up by Rs. 5 at Rs. 82 per kg in the Delhi chemicals market during the week under review due to shortage of stock and fall in import from Germany, reports NNS. Chatkolite hardened from Rs. 63 to Rs. 64.50 due to depleted stock position and reduced import from China. As a result of improved demand by gur and khandsari manufacturers, sulfolite recovered 50 paise only at Rs. 64 while sodium hydrosulphite kalali quoted cheaper by 50 paise at Rs. 36.50 because of slack demand.

In the wake of negligible stock position in the market and fall in import from France, tartaric acid flared up from Rs. 10,750 to Rs. 12,000 per 50 kg. Citric acid Chinese registered a rise of Rs. 65 at Rs. 2,225 on scanty supply while citric acid Bombay Dyeing ruled quiet at its previous closing of Rs. 2,500.

Sodium sulphate DCM black and red Marka advanced by Rs. 100 at Rs. 3,450 and Rs. 3,650 per tonne due to tight stock position. Sodium sulphate Gwalior Rayon quoted

higher at Rs. 3,350 against Rs. 3,250. Prices of soda-ash, soda bicarb and ammonia bicarb held steady at their previous week's level. Owing to fresh selling by stockists, paraffin wax declined by Rs. 25 at Rs. 840 per 50 kg. In the absence of enquiry at higher rates, slack wax dropped sharply by Rs. 500 at Rs. 9,500.

On account of heavy speculative demand and restricted supply from U.P., menthol flake, medium and bold rose from Rs. 365, Rs. 400 and Rs. 425 to Rs. 400, Rs. 450 and Rs. 475. But at the weekend in the face of increased offerings by stockists it reacted downward and closed at Rs. 330, Rs. 380 and Rs. 410 per kg respectively.

Titanium dioxide RC-822 and RCR-2 declined by Rs. 3 each at Rs. 152 each per kg on withdrawal of demand by consumers. Titanium dioxide anatase also moved down from Rs. 123 to Rs. 120 per kg. Trisodium phosphate and boric acid technical drifted lower by Rs. 10/25 due to lack of buying support. No change was reported in dyes and colours.

(DELHI MARKET RATES AS ON AUGUST 25, 1989)

Ammonia Bicarb (Per 25 Kg.)	150.00
Mercury (Per flask)	11,600.00
Soda ash (Per bag)	335/355.00
Ammonium Chloride (50 Kg.)	110/180.00
Caustic soda flakes (50 Kg.)	575/580.00
Citric acid (Per 50 Kg.)	2,225/2,500.00
Stable Bleaching Powder	
Shriram (Per 25 Kg.)	100.00
Stable Bleaching Powder KCl	
(Per 25 Kg.)	95.00
Stable Bleaching Powder	
Maruti (Per 25 Kg.)	90.00
Stable Bleaching Powder	
Modi (Per 25 Kg.)	98.00

Sodium Bicarbonate (50 Kg.)	290/300.00
Sodium Hydrosulphite (Per Kg.)	34.00/36.50
Rangolite (Per Kg.)	64.00/82.00
Boric acid Technical (Per 50 Kg.)	1,400.00
Paraffin Wax (Per 50 Kg.)	840.00
Tartaric Acid (Per 50 Kg.)	12,000.00
Borax Granular (Per 50 Kg.)	710.00
Borax Crystal (Per 50 Kg.)	715.00
Sodium Nitrite (Per 50 Kg.)	700/760.00
Sodium Nitrate (Per 50 Kg.)	425.00
Camphor Thal (Per Kg.)	116.00
Camphor Powder (Per Kg.)	103.00
Menthol Bold (Per Kg.)	410.00
Menthol Medium (Per Kg.)	380.00

Menthol Flake (Per Kg.)	330.00
Glycerine (Per Kg.)	55/58.00
Sodium Silicate (Per quintal)	250/300.00
Hexamine (Per Kg.)	33.50
Acetic Acid Glacial (Per Kg.)	14.50
Copper Sulphate	
(Per quintal)	2,350/2,700
Formic Acid (Per Kg.)	25.00
Formaldehyde (Per Kg.)	8.50
Hydrogen Peroxide (Per Kg.)	27.50
Calcium Carbonate	
(Per Tonne)	2,500/4,000
Acid Slurry Soft (Per Kg.)	24.00
Acid Slurry Hard (Per Kg.)	34.00
Phosphoric Acid (Per 50 Kg.)	1,050.00
Potassium Nitrate	
(Per quintal)	900/1,200.00
Potassium Permanganate	
(Per 50 Kg.)	2,800/3,200.00
Sodium Bichromate	
(Per 50 Kg.)	1,575/1,600.00
Trisodium Phosphate (50 Kg.)	490.00
Titanium Dioxide Anatase (Per Kg.)	120.00
Titanium Dioxide RC-822 (Per Kg.)	152.00
Titanium Dioxide K-Brand (Per Kg.)	108.00
Titanium Dioxide RCR-2 (Per Kg.)	152.00
Zinc Oxide	
(Per metric tonne)	42,000/52,000.00
Phenol Carbolic Acid (Per Kg.)	37.00
Carbon Tetrachloride (Per Kg.)	24.60
Chloroform (Per Kg.)	28.00
Sodium Sulphate	
(Per metric tonne)	3,350/3,650.00
Naphthalene Balls (Per 50 Kg.)	1,325.00

DYES & COLOURS	(Per Kg)
Naphthol AS	175/201.6
Naphthol ASG	180/295.2
Naphthol ASBS	210/248.4
Naphthol ASTR	265/360.4
Naphthol ASOL	210/238.6
Naphthol ASBO	195/260.7

DIRECT DYES	(Per Kg)
Black E. Conc.	110/176.1
Diazo Black B.T.	105/147.1
Green B	90/140.1
Blue 2-B	60/101.1
Blue 2-B 225% (JNR)	125.1
Sky Blue FB	160/235.1
Basic Auramine	55/110.1
Basic Rhodamine	300/425.1
Basic Methylene Blue	100/180.1
Basic Violet	150/180.1
Basic Malachite Green	150/165.1
Acid Orange	75/111.1
Congo Red H/C	75/120.1

Madras Market

The markets remained quiet during the week. There had not been much change in prices and prices maintained at old levels. Dyes intermediates scarcity continued affecting the prices of dyes. Activity in the

handloom front was quite good. Availability of NOCIL solvents continues to be difficult due to poor arrivals. Similar is the case with xylene and toluene, the availability of which are difficult and their prices rule high.

Magnesium Chloride (per kg)	3.50
Maleic Anhydride (per kg)	38.00
Menthol Crystals (per kg)	300.00
Oxalic Acid (per kg)	24.00
Paraffin Wax (per kg)	20.00
Potassium Bichromate (per kg)	36.00
Phosphoric Acid (per kg)	22.00
Polyvinyl Alcohol powder (per kg)	120.00
Pentaerythritol (per kg)	52.00
Phthalic Anhydride (per kg)	30.00
Soda Ash (TAC) (per 75 kgs)	385.00
Soda Ash (TATA) (per 75 kgs)	385.00
Sodium Bicarbonate (TATA) (per 50 kgs)	375.00
Sodium Silicate (per MT)	3,250.00
Sodium Bichromate (per kg)	28.00
Sodium Nitrate (per kg)	8.00
Sodium Nitrite (per kg)	15.00
Sodium Sulphide Flakes (per kg)	12.00
Sodium Bisulphite (per kg)	4.50
Sodium Alginate (per kg)	225.00
Sodium Acetate (per kg)	7.50
Sodium Sulphate (Anhydrous) (per kg)	3.00
Titanium Dioxide (Anatase) (per kg)	120.00
Titanium Dioxide (Rutile) (per kg)	140.00
Trisodium Phosphate (per kg)	11.00
Urea (Technical) (per kg)	3.00
Zinc Oxide (per kg)	54.00
Zinc Chloride Powder (per kg)	12.00
Zinc Sulphate (per kg)	7.00

SOLVENTS

Acetone -- HOCL (per kg)	20.00
Butanol (per kg)	36.00
Butyl Acetate (per kg)	44.00
Benzene (per lit)	17.00
Cellosolve (per kg)	50.00
Carbon Tetra Chloride (per kg)	23.00
Chloroform (per kg)	28.00
Diacetone Alcohol (per kg)	29.50
Diethylene Glycol (per kg)	47.00
Dichloroethane (per kg)	17.00
Di-octyl Phthalate (per kg)	50.00
Di-N-butyl Phthalate (per kg)	50.00
Ethyl Acetate (per kg)	22.00
Isopropyl Alcohol (per kg)	30.00
Methanol (per kg)	10.00
Methylene Chloride (per kg)	23.00
Methyl Ethyl Ketone (per kg)	42.00
Methyl Isobutyl Ketone (per kg)	50.00
Phenol (per kg)	38.00
Sorbitol (per kg)	15.00
Triethanolamine (per kg)	60.00
Trichloroethylene (per kg)	25.00
1-1-1 Trichloroethane (per kg)	27.00
Turpentine (per lit)	16.50
Toluene (per lit)	22.00
Xylene (per lit)	22.00

(MADRAS MARKET RATES AS ON AUGUST 26, 1989)

Acetic Acid Glacial (per kg)	16.00	Calcium Carbonate (Precipitated) (per MT)	4,750.00
Aluminium Sulphate Iron free (per MT)	3,750.00	Citric Acid (per kg)	48.00
Ammonium Bicarbonate (per 25 kgs)	150.00	Copper Sulphate (per kg)	24.00
Ammonium Chloride (per MT)	3,000.00	Cresylic Acid 98-99% (per kg)	120.00
Acid Slurry (per kg)	32.00	Pure Para Cresol 96% (per kg)	80.00
Barium Carbonate (per kg)	6.00	Meta Para Cresol 42% (per kg)	49.00
Barium Chloride (per kg)	5.25	Formic Acid (per kg)	26.00
Boric Acid Technical (per kg)	24.00	Formaldehyde (per kg)	8.00
Bleaching Powder (per 50 kgs)	250.00	Glue Flakes (per kg)	15.00
Borax (per 50 kgs)	700.00	Glycerine (per kg)	48.00
Caustic Soda Flakes -- Mettur Chemicals (per MT)	11,800.00	Hydrosulphite of Soda (TCPL) (per kg)	39.00
Caustic Soda Flakes -- Andhra Sugars (per MT)	11,800.00	Hydrosulphite of Soda (IDI) (per kg)	42.00
Calcium Chloride 70% Solid (per MT)	3,000.00	Hydrosulphite of Soda (BASF) (per kg)	42.00
Calcium Chloride Anhydrous (per MT)	5,750.00	Hexamine (per kg)	30.00
Calcium Carbonate (Activated) (per MT)	5,750.00	Hyflo Supercell (per kg)	20.00
		Hydrogen Peroxide (per kg)	29.00
		Litharge (per kg)	40.00
		Lead Acetate (per kg)	42.00
		Magnesium Carbonate (per kg)	19.50

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approximate sailing (5)
7/9	Zhitomir (Nhava Sheva)	Transocean	Odessa; Illyichevsk; Havana (Cuba); Genoa; Trieste; Piraeus; Marseilles; Barcelona; Varna; Bourgas. (Carting at CFS).	9/9
30/8	Ravidas (Ind)	S.C.I.	Felixstowe; Hamburg; Rotterdam; Antwerp; Bremen; Liverpool; Le Havre; Manchester; Avonmouth; London; Belfast; Aarhus; Oslo; Copenhagen; Gothenburg; Helsinki and all inland destinations. (Carting at Timber Pond No. 1).	6/9
1/9	Navigare (V-708)	Killick/ Merzario/ Seaspeed/ L. Triest/ Choice	Felixstowe; London; Liverpool; Manchester; Bristol; Avonmouth; Leeds; Glasgow; Tilbury; Birmingham; Dublin; Belfast; Rotterdam; Hamburg; Le Havre; Antwerp; Bremen; Bremerhaven; Fos; Valencia; Marseilles; Barcelona. (Carting at M-178/180 Cotton Depot). Jeddah; Hodeidah; P. Sudan; Ravenna; Ancona; Piraeus; Venice; Trieste. (Carting at M.O.D. No. 2). Tilbury; London; Felixstowe; Manchester; Liverpool; Avonmouth; Le Havre; Rotterdam; Hamburg; Antwerp; Bremerhaven and Scandinavian Ports. (Carting at Hay Bunder No. 3). Jeddah; Trieste; Venice; Ravenna; Rijeka; Naples. (Carting at M-171/173 C.D.). Leghorn; Marseilles; Valencia; Genoa; Cadiz; Barcelona; Ravenna; Venice; Naples; Trieste; La Spezia and other inland destinations. (Carting at 19-ID).	6/9
3/9	Maersk Clementine	Volkart Fleming	Leghorn; Marseilles; Naples; Barcelona; Bilbao; Bordeaux; Alicante; Genoa; Valencia; Bremen; Jeddah; Antwerp; Rotterdam; Bremerhaven; Hamburg; U.K. and Scandinavian Ports. (Carting at M.O.D. No. 3).	7/9
7/9	Integra	Tata Tea	Assab; Djibouti; P. Sudan	11/9
7/9	Leninsky Pioneer (Rus)	Transocean/ I.S.S.Co.	Tilbury; Avonmouth; Liverpool; Manchester; London; Felixstowe; Birmingham; Antwerp; (Rotterdam); Hamburg; Bremen; Copenhagen; Gothenburg; Oslo; Stockholm; Malmao; Leeds. Felixstowe; Tilbury; Antwerp; Rotterdam; Hamburg; Bremerhaven and Scandinavian ports via Hamburg.	10/9
7/9	Zhitomir	Transocean	Afghanistan. (Carting at Timber Pond No. 3).	9/9
3/9	Maersk Clementine (Sing)(V-8929)	Volkart Fleming	Penang; Singapore; Hongkong; Keelung; Kaoshiung; Busan; Main Japan Ports; Manila; Jakarta; Surabaya; Bangkok; P. Kelang; Chinese Ports. (Carting at M.O.D. No. 2).	7/9
1/9	Navigare (V-708)	Parekh/ Choice/ Merzario/ L. Triest/ Seaspeed	Muscat; Dubai; Sharjah; Abu Dhabi; Bahrain; Dammam; Kuwait; Baghdad. (Carting at Hay Bunder No. 4). Dubai; Dammam; Kuwait; Muscat; Bahrain; Abu Dhabi. (Cartg. 19-ID). Dubai; Sharjah; Abu Dhabi; Muscat; Doha; Dammam; Kuwait; Bahrain. (Carting a 14-VD for Merzario). Dubai; Dammam; Riyadh; Muscat; Abu Dhabi; Doha; Kuwait; Bahrain. Carting at 171/173 Cotton Depot for L. Triest).	6/9
3/9	Maersk Clementine	V. Fleming	Dubai; Dammam; Bahrain; Kuwait; Doha. (Carting at H.B. No. 5). Dubai; Dammam; Muscat; Bahrain; Kuwait; Riyadh; Doha. (Carting at M.O.D. No. 2).	7/9
7/9	Integra (V-11) (Pan)	Arebee/ Tata Tea	Dar Es Salaam & Mombasa (Direct); Kampala; Jinja; Tororo; Lugazi; Entebbe (Uganda); Kigali (Rwanda); Kitebe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre (Malawi); Maputo; Zanzibar. Mombasa; Dar Es Salaam (Direct); Beira; Mahe and inland destinations in East Africa.	11/9
30/8	Hoegh Cairn (Pan)	Patvolk	Montreal and Toronto via Halifax; New York; Boston; Norfolk; Charleston; Houston; Savanna; Wilmington; Philadelphia; Baltimore; New Orleans & FCL Chicago; Milwaukee; Atlanta; Dallas. (Carting at H.B. No. 5 and B.P. Extn.).	8/9

(2)	(3)	(4)	(5)
Maersk Clementine (Sing XV-8929)	Volkart Fleming	New York; Philadelphia; Baltimore; Norfolk; Charleston; Savannah; Jacksonville; Miami; New Orleans; Houston; Toronto; Montreal; Chicago; Atlanta; Denver; Dallas; Wilmington; Milwaukee; Detroit; Minneapolis; Memphis; Nashville; Cleveland; Phoenix; Boston; Los Angeles; Vancouver; Seattle; San Francisco; Portland; Long Beach; Mexican and S. American Ports. (Carting at M.O.D. No. 2).	7/9
Navigare (Voy-708)	Seaspeed/ Ocearac/ Choice	New York; Baltimore; Norfolk; Savanna; Charleston; Houston and S. American Ports. (Carting at Hay Bunder No. 3). New York; Baltimore; Philadelphia; Chicago; Boston; Norfolk; Atlanta; Charleston; Savannah; Miami; Houston and other inland destinations in U.S. East Coast and S. American ports. (Carting at Wadi Bunder No. 3). New York; Baltimore; Norfolk; Savannah; Montreal; Toronto; Charleston; Houston; New Orleans; Miami; Tampa; Chicago and other inland destinations. (Carting at 19-ID).	6/9
Ravidas (Ind)	S.C.I.	New York; Baltimore; Savannah (Direct) and other inland destinations. (Carting at Timber Pond No. 1).	6/9
Leninsky Pioneer	Marathon	Boston; New York; Baltimore; Norfolk.	10/9
Maersk Clementine	V. Fleming	Lagos/Apapa; Dakar; Freetown; Monrovia; Lome; Cotonou; Douala; Tema. (Carting at M.O.D. No. 2).	7/9
Navigare	Seaspeed	West African Ports. (Carting at Hay Bunder No. 5)	6/9

VESSELS DUE IN BOMBAY FOR IMPORT DISCHARGE

Date	Steamer's Name	Agents	From
	Regine	Sai Ship	U.K. Cont.
	Sulu Express	S.C.I.	U.K. Cont.
	Zhitomir (Nhava Sheva)	Transocean	Rus./Med.

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- (19) SODIUM FLUORIDE
- (20) AMMONIUM BIFLUORIDE
- (21) AMMONIUM FLUORIDE
- (22) SODIUM SULPHATE
- (23) FLUOBORIC ACID
- (24) LEAD FLUOBORATE
- (25) COBALT SULPHATE
- (26) SULPHURIC ACID

Materials Imported

BOMBAY

(From 5.5.89 to 15.5.89)

ACETYLENE BLACK: From France: Cable Corporation of India Ltd., 250 Kgs., Rs. 1,35,970.

ACRYLAMIDE: From Japan: Kwal-Agro Vat Inds. Ltd., 5 MTs., Rs. 1,18,021; Shree Anujkumar & Co., 1,000 Kgs., Rs. 47,208.

ACRYLIC ACID: From Japan: Colour Chem Ltd., 6,000 Kgs., Rs. 1,90,720; Thermax Pvt. Ltd., 48,000 Kgs., Rs. 14,16,114.

ADIPIC ACID: From FRG: Hindustan Ciba Geigy Ltd., 2,700 Kgs., Rs. 61,193; From Netherlands: Sewak International, 5,400 Kgs., Rs. 1,22,396.

ALDEHYDE C-12: From Sweden: Export Corporation, 250 Kgs., Rs. 95,412.

ALUMINIUM OXIDE: From FRG: Sukul Enterprises, 72,000 Kgs., Rs. 7,55,468.

ALUMINIUM SILICATE: From FRG: Anar Polymer Industries, 250 Kgs., Rs. 6,295; Sigma Paints Ltd., 500 Kgs., Rs. 29,589.

2-AMINO 3-BROMO 5-NITRO BENZONITRILE: From Japan: Sandoz (India) Ltd., 1,450 Kgs., Rs. 5,52,260; From Sweden: Sandoz (India) Ltd., 160 Kgs., Rs. 6,61,460; From Switzerland: Sandoz (India) Ltd., 4,320 Kgs., Rs. 13,22,920.

AMINOPHYLLINE: From China: Manu Trading Co., 3,000 Kgs., Rs. 3,99,190.

AMINO PICOLINE: From Switzerland: Ranbaxy Laboratories Ltd., 2,000 Kgs., Rs. 3,50,914.

AROMATIC CHEMICALS: From FRG: Gupta & Co. Ltd., 500 Kgs., Rs. 58,758; Kanta Chemicals, 255 Kgs., Rs. 1,01,150; Spac Aromas, 175 Kgs., Rs. 34,752; From Netherlands: FFC Aromas Pvt. Ltd., 500 Kgs.,

Rs. 5,50,761; The Tata Oil Mills Co. Ltd., 1,200 Kgs., Rs. 3,52,896; From UK: Hindustan Lever Ltd., 250 Kgs., Rs. 50,807.

ARSENIC METAL: From China: Emmar Metal Inds., 2,000 Kgs., Rs. 56,470.

ARSENIC TRIOXIDE: From Korea: The Mahalakshmi Glassworks, 25,000 Kgs., Rs. 1,98,754.

L-BASE: From China: Gee Chemicals, 400 Kgs., Rs. 3,14,721.

BENTHIOCARB: From Japan: Pesticides India, 16,060 Kgs., Rs. 8,99,159.

BIS METHYL SILYL UREA: From FRG: Max India Ltd., 12,000 Kgs., Rs. 18,63,487.

BISPHENOL A: From Japan: Dr. Beck & Co. Ltd., 16,000 Kgs., Rs. 4,40,609; Monopal Chemicals Pvt. Ltd., 5,000 Kgs., Rs. 1,41,624.

BISPHENOL: From Netherlands:

NOCIL, 6 MTs., Rs. 2,04,091.

BROMINE LIQUID: From Israel: D. Jamnadas & Co., 11,340 Kgs., Rs. 2,87,299; Gupta Trading Co., 11,340 Kgs., Rs. 2,87,299; K.D. Sanghvi & Co., 11,340 Kgs., Rs. 2,87,299; Matraco India Ltd., 63.504 MTs., Rs. 8,61,598; Nanavati & Co. Pvt. Ltd., 4,536 Kgs., Rs. 1,14,920; Sontara Organo Inds., 11,340 Kgs., Rs. 2,94,437; From Netherlands: Atic Indus. Ltd., 11,340 Kgs., Rs. 2,94,437; Bakul Chemicals Pvt. Ltd., 11,340 Kgs., Rs. 2,94,437; Colour Chem Ltd., 22,680 Kgs., Rs. 5,74,598; Nanavati & Co. Pvt. Ltd., 11,340 Kgs., Rs. 2,87,299; Searle India Ltd., 11,340 Kgs., Rs. 2,87,299.

BUTACHLOR TECH.: From USA: Artee Minerals, 15,840 Kgs., Rs. 7,41,828; Bharat Pesticides Mfg. Co., 50,760 Kgs., Rs. 7,37,082; Herbicides India Ltd., 1,04,760 Kgs., Rs. 21,92,514.

BUTACHLOR: From USA: Markfed Agro Chemicals, 2095.2 Lbs., Rs. 42,86,120.



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N-BUTYRIC ACID: From FRG: S. Flavours & Fragrances of India, 3,000 Kgs., Rs. 71,769.

SECONDARY BUTYL ALCOHOL: From USA: RBSF Intl., 1,172.50 Kgs., Rs. 28,967.

N-BUTYL MERCAPTAN: From Netherlands: Reliance Industries Ltd., 26,520 Kgs., Rs. 9,01,411.

BUTYL PHENOL: From USA: Cibatul Ltd., 6,000 Kgs., Rs. 1,32,183.

CALCIUM CARBONATE: From France: Cable Corpn. of India Ltd., 21,000 Kgs., Rs. 73,654.

CALCIUM FLUORIDE: From Japan: Sylvania and Laxman Ltd., 400 Kgs., Rs. 34,161.

CAPROLACTAM: From Belgium: LML Fibres Ltd., 337.250 Kgs., Rs. 1,02,95,541; From Netherlands: Nirlon Syn. Fibres & Chemicals Ltd., 306 MTs., Rs. 93,41,543; From Spain: Modipon Ltd., 2,50,000 Kgs., Rs. 75,82,757; From USA: Garware Nylons Ltd., 1,25,000 Kgs., Rs. 36,19,289.

CARBON ACTIVATED: From USA: Parke Davis India Ltd., 240 Lbs., Rs. 14,336.

CARBON BLACK: From FRG: Goodlass Nerolac Paints Ltd., 2,400 Kgs., Rs. 3,79,748; Star Oxides & Chemicals Ltd., 1,800 Kgs.,

Rs. 1,17,316; From Japan: Goodlass Nerolac Paints Ltd., 400 Kgs., Rs. 26,898; From USA: Kores India Ltd., 20,000 Lbs., Rs. 2,96,781.

L-CARVONE: From France: Proctor & Gamble India Ltd., 2,000 Kgs., Rs. 6,70,858.

2-CHLORO PROPIONIC ACID: From Japan: Chemo Pharma Laboratories Ltd., 16.08 MTs., Rs. 3,77,847.

CINNAMIC ALDEHYDE: From FRG: H & R Aromatics Pvt. Ltd., 2,400 Kgs., Rs. 1,21,884.

CITRIC ACID: From China: Sabari Textiles Pvt. Ltd., 15,000 Kgs., Rs. 2,13,690.

CITRIC ACID BP 80: From China: Gupta Trading Co., 17,000 Kgs., Rs. 2,94,264.

CITRIC ACID MONOHYDRATE: From China: Omega International, 17,500 Kgs., Rs. 2,47,843.

CITRIC ACID MONOHYDRATE BP 80: From China: M. Patwari Traders Pvt. Ltd., 15,000 Kgs., Rs. 6,05,838; Sabari Textiles Pvt. Ltd., 5,000 Kgs., Rs. 71,230.

CITRIC ACID MONOHYDRATE USP: From China: Omega International, 17,500 Kgs., Rs. 2,47,843.

CITRONELLOL: From UK: Gupta & Co. Pvt. Ltd., 525 Kgs., Rs. 83,733.

COUMARIN: From France: Industrial Perfumes Ltd., 600 Kgs., Rs. 1,66,173.

PARA CRESOL 98%: From UK: Hico Products Ltd., 16,000 Kgs., Rs. 7,13,657.

PARA CUMIDINE: From Japan: Hoechst India Ltd., 15,200 Kgs., Rs. 11,44,692.

2-CYANOPYRAZINE 99% PURITY: From Japan: Calyx Chemicals, 600 Kgs., Rs. 3,55,462.

CYANURIC CHLORIDE: From Belgium: Alfa Industries, 1,000 Kgs., Rs. 46,167; Anant Industries, 500 Kgs., Rs. 23,084; Ashok Chemical Industries, 500 Kgs., Rs. 23,084; Atic Industries Ltd., 22,000 Kgs., Rs. 10,15,684; Atul Products Ltd., 2,000 Kgs., Rs. 92,335; Delite Chemicals, 500 Kgs., Rs. 23,084; Dye Chem Industries, 1,000 Kgs., Rs. 46,167; Harish Chemical Engineering, 1,000 Kgs., Rs. 46,167; Kaplast Chemicals, 1,000 Kgs., Rs. 46,167; Shrinathji Chemicals Inds., 500 Kgs., Rs. 23,084; Super Dye Chem, 1,000 Kgs., Rs. 46,167; From FRG: Rajankumar & Bros (Impex) Pvt. Ltd., 8,000 Kgs., Rs. 2,69,340.

CYCLOHEXANONE: From Netherlands: Tony Electronics Pvt. Ltd., 16.614 MTs., Rs. 3,69,568.

CYSTEAMINE HYDROCHLORIDE: From Japan: Ranbaxy Laboratories Ltd., 1,000 Kgs., Rs. 1,29,036.

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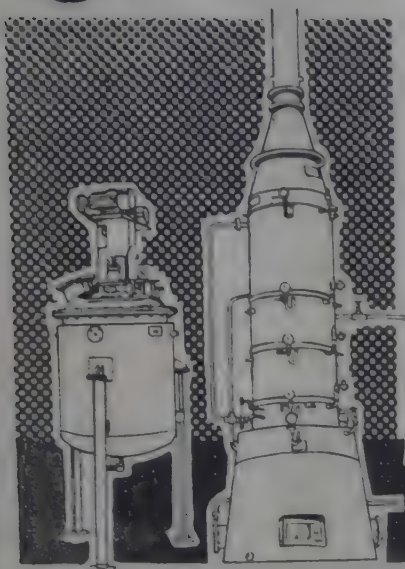
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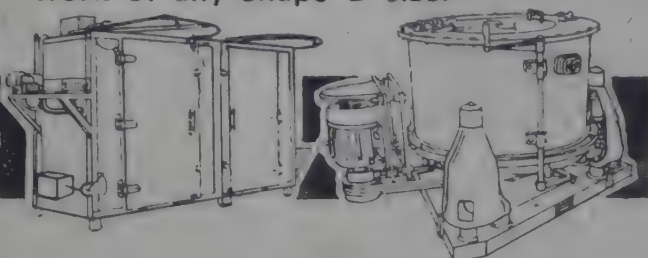


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DDVP TECH.: From Switzerland: Bharat Pesticides Mfg. Co., 32,560 Kgs., Rs. 15,37,096.

DESMODUR T 80: From Belgium: Dinesh Jain & Bros., 13,500 Kgs., Rs. 4,38,022; From FRG: Jai Industries, 19,000 Kgs., Rs. 6,47,302.

DICALCIUM PHOSPHATE: From USA: Balsara Hygiene Products, 38,400 Kgs., Rs. 2,63,138.

2-6 DICHLOROANILINE: From Japan: Hindustan Ciba Geigy Ltd., 1,560 Kgs., Rs. 7,11,898.

2 (2,2 DICHLOROVINYL) 3,3 DIMETHYL CYCLOPROPANE CARBOXYLIC ACID METHYL ESTER: From USA: BASF India Ltd., 14,968 Kgs., Rs. 64,03,042.

2,6 DIETHYLANILINE: From USA: Gujarat Narmada Valley Fertilisers, 13,880 Kgs., Rs. 6,22,486.

3,3 DIETHYL 2,4 DIOXO TETRA-HYDRO PYRIDINE: From Switzerland: Roche Products Limited, 931.840 Kgs., Rs. 6,14,292.

DL-ETHYL ETHOXY METHYLENE MALONATE: From FRG: Samol Pharma Chem Pvt. Ltd., 600 Kgs., Rs. 1,22,740.

2,4 DIFLUORO NITROBENZENE PURITY MIN 98%: From UK: FDC Ltd., 500 Kgs., Rs. 2,37,210.

2,4 DIHYDROXY QUINOLINE: From FRG: Rathi Dye Chem Pvt. Ltd., 480 Kgs., Rs. 1,76,094.

DI-ISOPROPYLAMINE: From FRG: Pyrapure Chemicals Pvt. Ltd., 1,268 Kgs., Rs. 69,806.

DIMETHYL ACETAMIDE: From FRG: J.K. Synthetics Ltd., 74,100 Kgs., Rs. 16,17,204; From Turkey: J.K. Synthetics Ltd., 45,600 Kgs., Rs. 10,04,590.

DIMETHYL ACETYL SUCCINATE: From Austria: Roha Dyechem Pvt. Ltd., 15,200 Kgs., Rs. 7,53,387.

DIMETHYL AMINO ETHANOL: From FRG: Associated Chemo Pharma Pvt. Ltd., 1,080 Kgs., Rs. 39,241.

DIMETHYL BENZYL CARBINYL ACETATE: From Japan: S.H. Kelkar & Co. Ltd., 1,000 Kgs., Rs. 1,64,441.

DIMETHYL DICHLORO SILANE: From FRG: Armour Chemicals Ltd., 14,400 Kgs., Rs. 5,17,344; Kiran Chemicals, 1,000 Kgs., Rs. 38,613; Morpen Lab Ltd., 4,000 Kgs., Rs. 1,48,608.

DIMETHYL FORMAMIDE: From FRG: Parke Davis (India) Ltd., 4,180 Kgs., Rs. 79,999; From Japan: Aquapharm Chemical Co. Pvt. Ltd., 15,200 Kgs., Rs. 2,76,868.

DIMETHYL SULPHOXIDE: From USA: Globe Organics Ltd., 34,473.6 Kgs., Rs. 8,22,397; Rallis India Ltd., 1,360.78 Kgs., Rs. 36,581.

DIMETHYL THIOPHOSPHORYL CHLORIDE: From USA: Cyanamid India Ltd., 63,866.368 Kgs., Rs. 24,62,259.

DIOCTYL TIN OXIDE: From Japan: Dura Chem Corporation Pvt. Ltd., 4,000 Kgs., Rs. 5,66,458.

DIPHENYL METHANE: From USA: Godrej & Boyce Mfg. Co. Ltd., 57,000 Kgs., Rs. 17,40,092.

DIPHENYL METHANE DIISOCYANATE: From FRG: Greaves Fosco Ltd., 18,000 Kgs., Rs. 6,65,634.

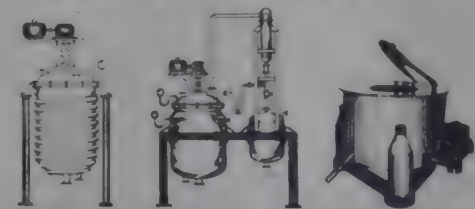
DL-2-VINYL TOLUIDENE: From FRG: Dr. Beck & Co. (I) Ltd., 25 Kgs., Rs. 818.

EPICHLOROHYDRINE: From Japan: Anand Organics Pvt. Ltd., 3,120 Kgs., Rs. 89,355; Lupin Laboratories Ltd., 3,120 Kgs., Rs. 89,355; From UK: National Coating Industries, 100 Kgs., Rs. 48,253; From USA: Synthetics & Polymers Inds., 16,347.2 Kgs., Rs. 4,77,308.

ERYTHROMYCINE THIOCYANATE: From USA: Vista Organics Pvt. Ltd., 2,588.23 Kgs., Rs. 32,84,753.

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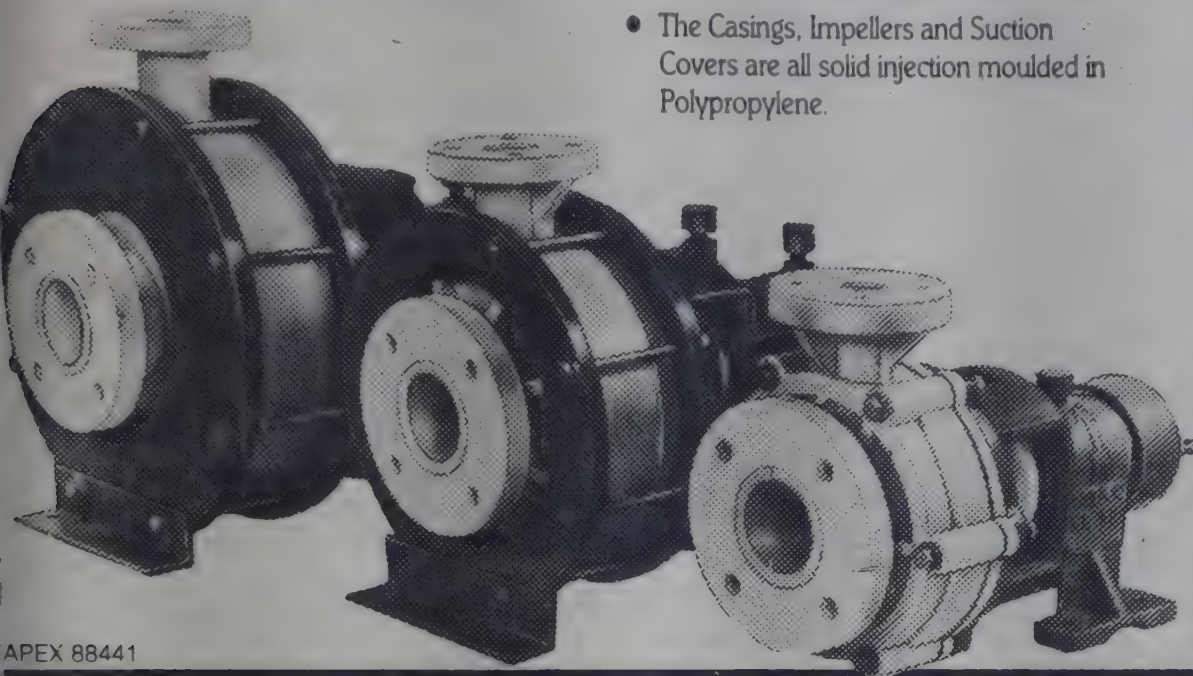
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APEX 88441

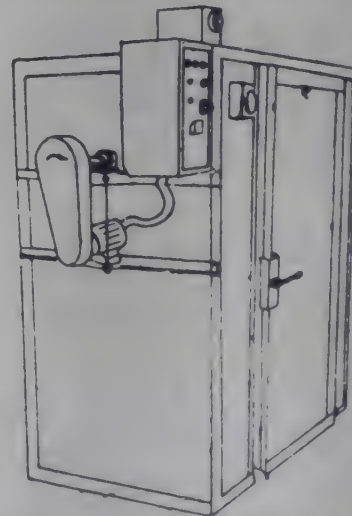
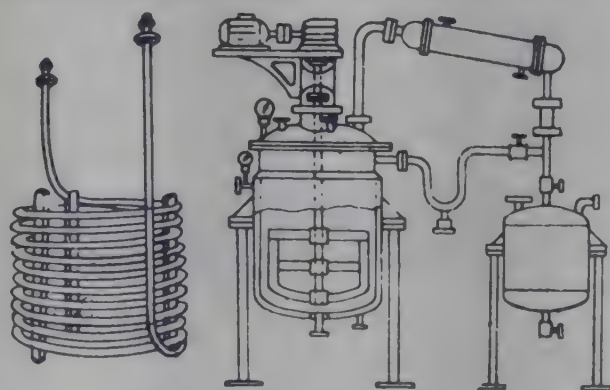
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2-ETHYL HEXANOIC ACID: From Japan: Brij Chemicals Pvt. Ltd., 7,020 MTs., Rs. 1,11,100; From Sweden: Dura Chemical Corp. Pvt. Ltd., 14,820 Kgs., Rs. 2,50,800.

ETHYL MERCAPTAN: From Netherlands: Cyanamid India Ltd., 19,050 Kgs., Rs. 4,23,647.

ETHYL METHACRYLATE: From FRG: PDI Chemicals Ltd., 1,980 Kgs., Rs. 98,146.

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GAMMA FERRIC OXIDE (MAGNETIC IRON OXIDE): From Japan: Straw Products Ltd., 7,000 Kgs., Rs. 10,137.

GLYOXYLIC ACID METHYL ESTER HEMIACETAL: From Austria: Sandoz India Ltd., 35,200 Kgs., Rs. 12,16,633.

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Total Protein	%	43.0	55.0	73.5
Water Solution	5%	Clear	Clear	Clear
Copper	mg/100 gm	-	11.0	14.5
Iron	mg/100 gm	-	18.0	23.5
Vitamins				
B1	mcg/g	40.0	53.0	70.0
B2	mcg/g	25.0	38.0	50.0
B6	mcg/g	15.0	16.5	21.8
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Niacine	mcg/g	150.0	236.8	313.0



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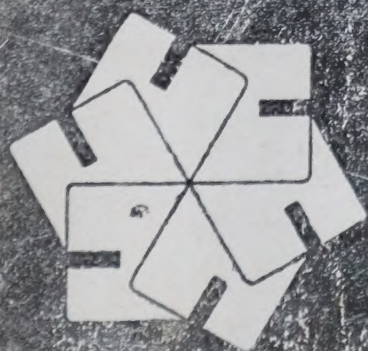
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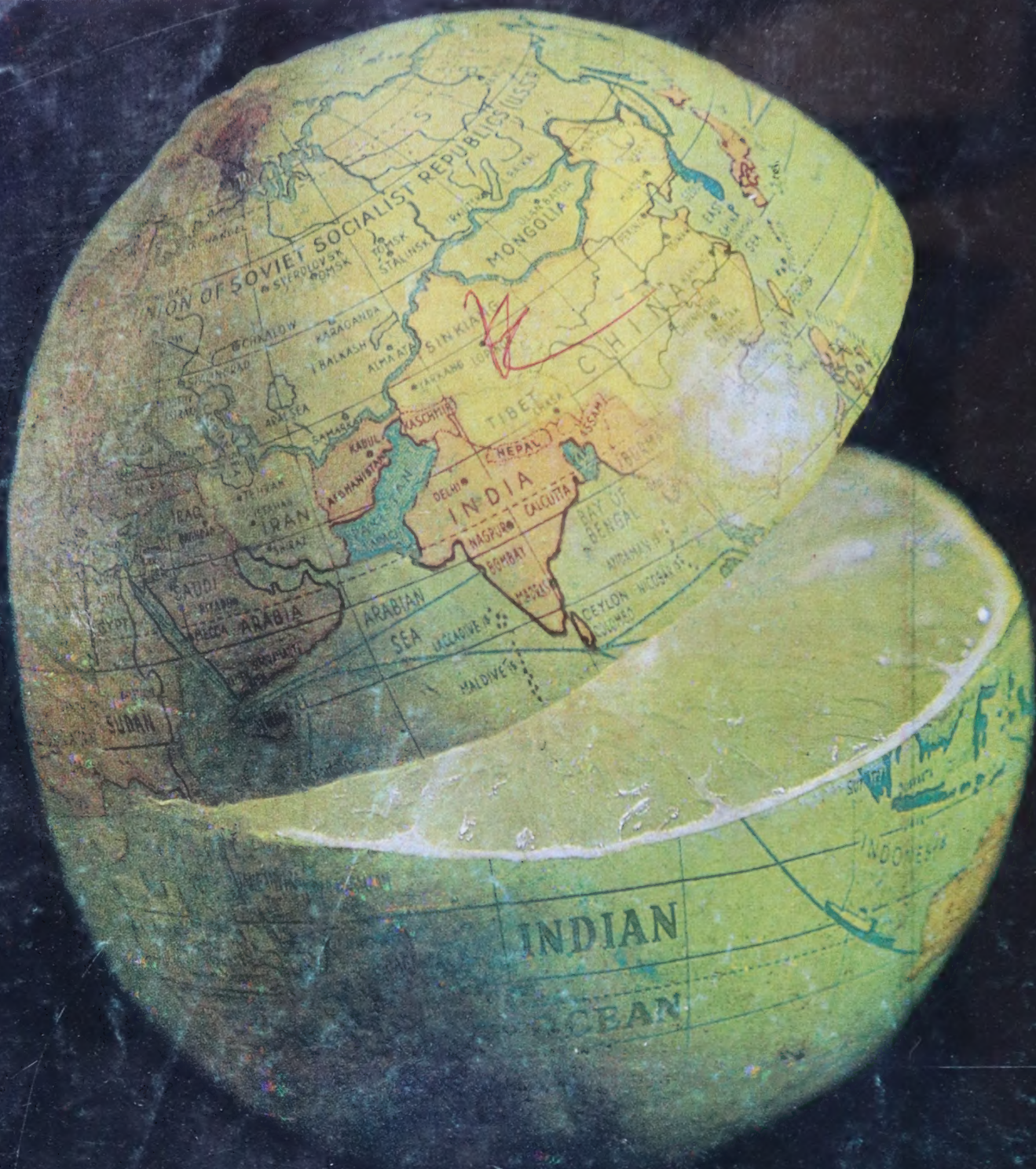
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